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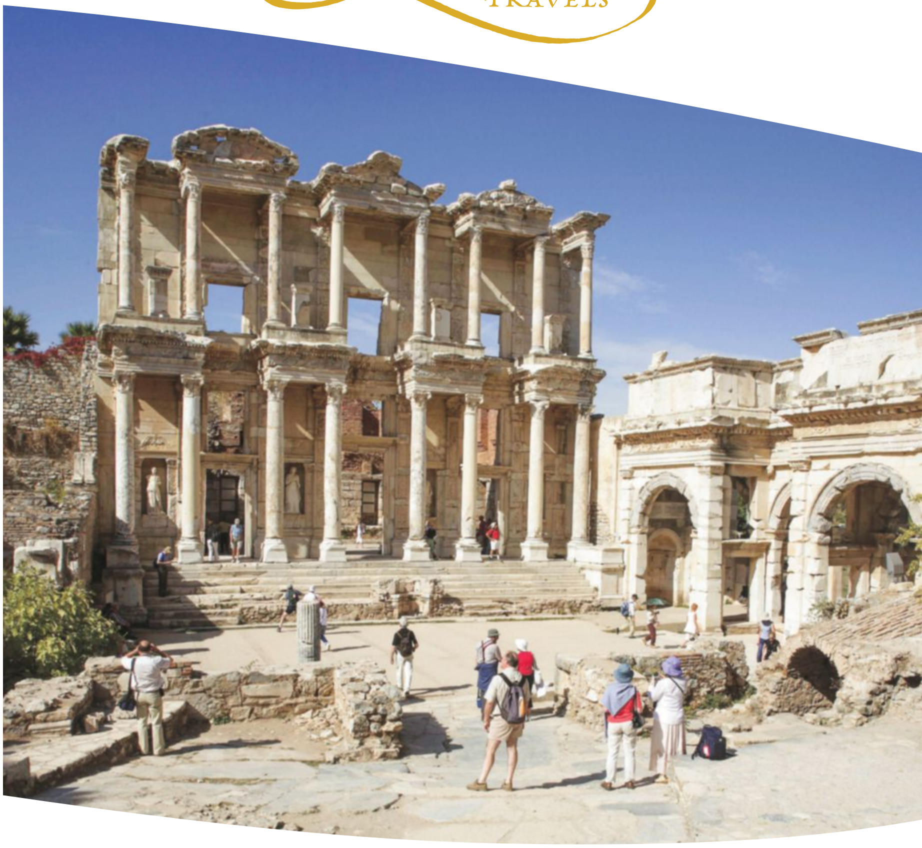

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**Cover:** A 1st-century B.C. fresco from a villa in Roman Arles.
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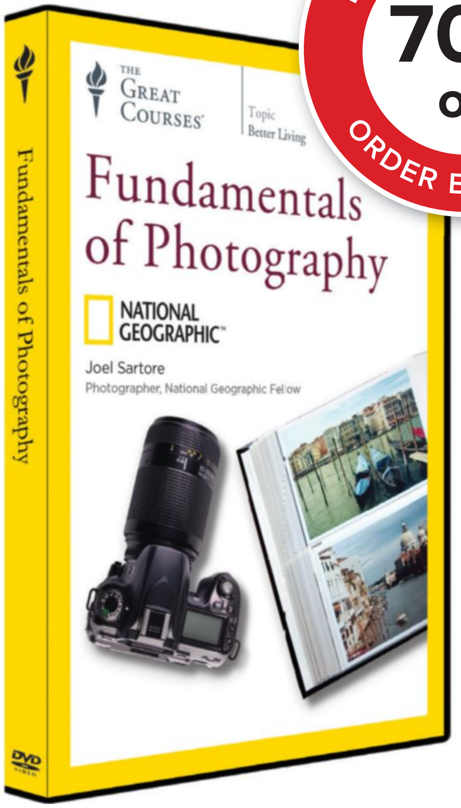
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# In Evidence

A forbidding location on a Baltic island is the scene of an ancient massacre involving perhaps hundreds of victims. In "Öland, Sweden. Spring, A.D. 480" (page 26), contributing editor Andrew Curry investigates why members of the island's once-thriving mercenary class abruptly turned on their neighbors, sparing no one

Contributing editor Jason Urbanus, in "France's Roman Heritage" (page 32), tells of recent excavations in Arles of an extraordinary first-century B.C. home appointed with frescoes on par with Rome's finest examples. By studying the stunning remains of these paintings, archaeologists are learning much about the lifestyle that wealth and position could confer in the Roman colonies.

The arresting sight of remote Dunluce Castle, situated atop 100-foot cliffs overlooking the North Atlantic, fires the imagination. In "The Lost Town of Dunluce" (page 44), journalist Erin Mullally speaks with archaeologists who have recently discovered the largely undisturbed remains of a vital seventeenth-century settlement immediately next to the castle, opening a new chapter in its story, including its place in Ireland's history.

Maya pottery vessel

The 600 B.C. burial of two individuals in the Peruvian Andes is yielding delicate evidence of the source of their considerable power. "Colors of the Priesthood" (page 36), by senior editor Daniel Weiss, explores what it may have meant to straddle the line between technology and magic.

St. Catherine's Monastery in Egypt's Sinai Peninsula, built in the sixth century, is perhaps best known for its enormous collection of Christian manuscripts, second only to that of the Vatican. A number of its texts were long ago discovered to have been written atop even more ancient ones, creating what are called palimpsests. "Recovering Hidden Texts" (page 38), by online editor Eric A. Powell, outlines the work of the Sinai Palimpsest Project and St. Catherine's librarian, Father Justin. Together they are using modern imaging techniques to uncover rare, significant texts and even languages that would otherwise be utterly lost.

"An Ancient Battlefield Emerges" (page 48), by journalist Lauren Hilgers, tells of the work of archaeologists in northern Vietnam who are uncovering definitive evidence of an extraordinary thirteenth-century Vietnamese military victory over the invading naval forces of the powerful, notorious Kublai Khan. The Battle of Bach Dang was apparently won by a combination of military tactics and deep knowledge of the watery, ever-shifting landscape in which it played out.

And don't miss Letter from Guatemala (page 55). Millions upon millions of potsherds represent only the beginning of the trail that has led researchers to Kaminaljuyú, an ancient Maya city beneath the modern capital.

Claudia Valentino

**Claudia Valentino**
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**Account Manager**
Jeff Posner
PRI Communications Inc.
Jeff@pricommunicationsinc.com
516-594-2820 x11

**Circulation Consultant**
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For production questions
contact production@archaeology.org

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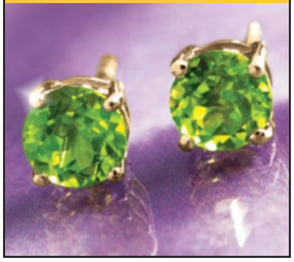

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## FROM THE PRESIDENT

# Arizona's Vibrant Culture

A recent trip to Arizona to lead a meeting of the AIA Governing Board gave me an opportunity to experience some of the archaeological riches of the Southwest. It provided telling reminders of how the peoples of the region adapted to the challenges of the arid environment they occupied. And, too, it was clear that cultural echoes from the past remain evident to this day.

Ventana Cave is one of the most significant prehistoric sites in North America. Located on the side of a mountain in a remote part of the Tohono O'odham Reservation, it looks out over an immense saguaro cactus forest. Excavations by Emil Haury in the 1940s demonstrated that this huge rockshelter had been inhabited by hunter-gatherers since the beginning of the Holocene, 11,700 years ago. They successfully exploited the wild plants and animals of the region and later even engaged in dryland farming. Today the Tohono O'odham people still visit the site in early summer to collect the fruits of the saguaro.

Casa Grande, Arizona

The Hohokam site of Casa Grande, an extensive adobe ruin complex, has the "Great House" as its most impressive surviving building. Casa Grande was one of many villages that flourished along the Gila River in the 1300s. The inhabitants dug numerous canals to irrigate their fields and raise maize and other crops. These desert farmers were thus able to flourish in what today is an arid landscape. Many other related Hohokam sites were once located along the Salt River where the city of Phoenix now stands. A drought in the 1400s undermined the Hohokam way of life and brought these settlements to an end.

Spanish missionaries traveling north from Mexico in the 1600s were the first to bring knowledge of these sites to the wider world. After visiting Casa Grande, they established settlements of their own. Several are situated along the valley of the Santa Cruz River just north of the border with Mexico. The mission at Tumacácori and the presidio at Tubac were built in the 1700s and survive today, albeit in a semi-ruined state. The contemporary mission of San Xavier del Bac, however, has remained in use since it was founded and has recently been restored.

The desert Southwest today is home to descendants of prehistoric populations living alongside families whose ancestors immigrated from Mexico centuries ago. People have long migrated to the Southwest—and continue to arrive there—from places throughout the United States. The vibrant mix of ethnicity and culture in evidence immediately sets any visitor on a quest to understand the region's deep roots in the past.

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# LETTERS

## Another Job for the Alchemists

Having been to Wittenberg and to the Museum for Prehistory in Halle numerous times, I read with great interest your article, "The Alchemist's Tale" (January/February 2016). You have presented a convincing argument for the advance from alchemy to chemistry, somewhat paralleling the advance from astrology to astronomy. I would like to mention another valuable contribution of alchemy—the transformation of dirt to porcelain. After the alchemist Johann Friedrich Boettger was forced to flee the court of the Prussian king in Berlin because of his unsuccessful attempts to create gold, he was hired by Augustus the Strong, king of Poland and elector of Saxony, to produce a different kind of "gold"—the white porcelain of which the king was so very fond. Boettger founded the first porcelain manufactory in Europe in the Albrechtsburg, near Dresden, Germany, in 1710, enriching the coffers of the king and of the state of Saxony.

*Hermann Helmuth*
*Peterborough, Ontario*

## Invisible No More

It is always with great attention that I read ARCHAEOLOGY magazine, as it is very informative regarding what is transpiring in the field of archaeology and in the understanding of history. I found the article "Reading the Invisible Ink" (January/February 2016) particularly interesting. The use of multispectral imaging serves as an essential noninvasive method of scanning ancient documents in order to better understand and interpret them. It's also good to see that this type of work is being presented, as it helps to educate the public.

*Wolfgang Golser*
*Tucson, AZ*

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## A Cowboy Remembers

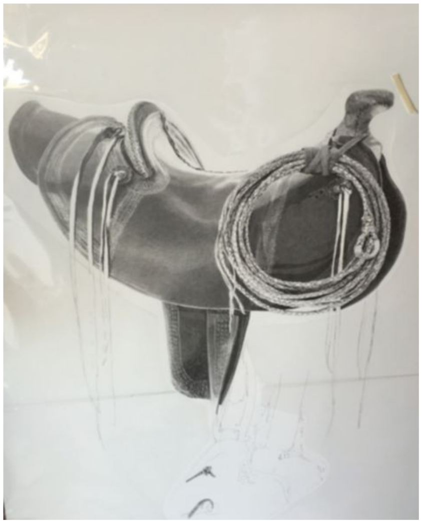
Thank you for your article "Ballad of the Paniolo" (January/February 2016). I was born on Maui in 1934 and spent much time at Ulupalakua Ranch, which my grandfather Frank Baldwin had acquired in 1921. Ikua Purdy, who is mentioned in the first paragraph, came over from Parker Ranch to be head wrangler and saddlemaker at Ulupalakua. I knew Ikua and roped on one of his famous saddles when my dad gave me his in 1945. Ikua also braided a rawhide lariat for me.

About 25 years ago we were at a Cowboy Artists of America show in Phoenix and I recognized a painting of Hawaiian cowboys, titled *Calf Roping at the Puuwawa Ranch*, from the saddles and stone wall. I looked up the artist, Fred Fellows of Montana, and asked him if he knew my cousin, Freddy Rice, then manager at Puuwawa—which of course he did. That encounter led to the creation of a bronze sculpture of my saddle for the Hawaii Cattlemen's Association. I still have the saddle and the bronze, and currently a local Tucson artist is finishing a painting of the saddle for me.

As Samir S. Patel writes in the article, this is a great example of ethnogenesis. It is a unique mix of Hawaiian, Hispanic, American, and Asian cultures. All our hands spoke Hawaiian and I was fortunate to grow up understanding some of the "old ways." Our accountant, storekeeper, and head cowboy were Japanese, while the rest were pure Hawaiian. A museum has opened on the Big Island dedicated to the paniolo, and there is a large bronze of Ikua Purdy near the entrance.

I still think of early dawn cattle drives on the slope of Haleakala, the sounds of the blacksnake whips, and the cattle lowing. Thanks to ARCHAEOLOGY—I am a longtime subscriber—for refreshing these memories for me!

*Michael Baldwin*
*Tucson, AZ*



**Tucson artist Martha Thompson's unfinished painting of reader Michael Baldwin's paniolo saddle**

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ARCHAEOLOGY (ISSN 0003-8113) is published bimonthly for $23.95 by the Archaeological Institute of America, 36-36 33rd Street, Long Island City, NY 11106. Periodicals postage paid at Long Island City, NY, and additional mailing offices. POSTMASTER: Send address changes to Archaeology, P.O. 433091, Palm Coast, FL 32143.

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# From the Trenches

LATE-BREAKING NEWS AND NOTES FROM THE WORLD OF ARCHAEOLOGY

## Legends of Glastonbury Abbey

Glastonbury Abbey, Somerset, England

Although today it stands in ruins, Glastonbury Abbey, in Somerset, England, is still a powerfully evocative place, shrouded in history, religion, and mythology. One story claims that Joseph of Arimathea, legendary keeper of the Holy Grail, founded the first Christian church in Britain at Glastonbury shortly after the death of Christ. Another holds that in 1191, monks from the abbey unearthed a hollowed-out log containing two bodies and an inscribed cross that read: "Here lies buried King Arthur and his wife Guinevere."

The traditions and myths surrounding Glastonbury Abbey are perhaps key among the reasons it developed into one of the most important—and wealthiest—monasteries in Europe. But skeptics have long decried these stories as inventions by medieval monks to fill the abbey's coffers, especially after a massive fire destroyed the monastery in 1184. Archaeologist Roberta Gilchrist of the University of Reading has recently completed a multiyear project aimed at constructing a new history of Glastonbury Abbey, unencumbered by previous assumptions based solely on myth. "Glastonbury Abbey holds a unique place in the history of medieval monasticism and in the development of English cultural identity," says Gilchrist. "Yet despite its historical and cultural significance, relatively little was known about the abbey's archaeology."

Most of the Glastonbury Abbey Project's efforts were focused on reevaluating data from previous excavations. From 1904 to 1979, at least 36 excavations were completed, but much of that material was lost or never published. It has also been frequently misinterpreted. Gilchrist and her team have spent several years combing through a century's worth of archives, as well as conducting new radiocarbon dating and chemical composition analysis on previously excavated artifacts. "Our goals were to assess the scholarly significance of the excavations and provide a new historical source of evidence for understanding the site," says Gilchrist.

The project's discoveries underscore Glastonbury's long and complex history, including newly identified evidence of Roman and Saxon activity that predates the abbey's foundation. A reassessment of glass-producing furnaces on the site proved not only that Saxon workers were recycling Roman glass imported from Europe, but also that the furnaces are nearly 300 years older than expected and are associated with the construction of the first stone churches around A.D. 700. According to Gilchrist, this would make the site's glass manufacturing complex among the earliest and most substantial in Saxon England.

Researchers also reevaluated the purported site of King Arthur's grave. Both the skeletal remains and the inscribed cross disappeared after the dissolution of the abbey in 1539, but archaeologist Ralegh Radford claimed to have found the original burial site when he excavated at Glastonbury during the 1950s and 1960s. Unfortunately, there is little proof connecting that site with the famous king. "Radford may have exaggerated his evidence," says Gilchrist. "Reassessment of his excavation records shows that this was merely a pit in a cemetery, dating to sometime between the eleventh and fifteenth centuries."

Analysis of the twelfth-century abbey church indicates that the monks themselves purposefully promoted the site's historic reputation. As they rebuilt the church after the great fire in 1184, instead of using contemporary architectural styles, they inserted antiquated and retrospective elements, apparently to deliberately feign antiquity.

There is no doubt that many of the myths surrounding Glastonbury Abbey were at least partially created or propagated in both medieval and modern times. However, according to Gilchrist, too much media attention has focused on the new evidence that seems to refute Glastonbury's mythical traditions. For her, there is room for both archaeology and legend to coexist. "At Glastonbury, people respond on a personal level to the place and its historical, legendary, and spiritual resonances. We didn't claim to disprove the legendary associations, nor would we wish to," she says. "Archaeology can help us to understand how legends evolve and what people in the past believed." In fact, she notes, the project has actually uncovered the first definitive proof of occupation at the Glastonbury Abbey site during the fifth century—when Arthur allegedly lived.

—Jason Urbanus

**Glass from Glastonbury Abbey**

## OFF THE GRID

***As with many archaeological sites, the Côa Valley in northeastern Portugal came to the attention of authorities because of a dam. An energy company commissioned an archaeological survey prior to beginning construction, which led to the discovery of one of Europe's largest open-air "museums" of Paleolithic rock art. "Petroglyphs can't swim," stated a campaign to protect the works. These efforts helped stop the building of the dam and ensured the survival of the Côa Valley's heritage. UNESCO describes it as "an outstanding example of the sudden flowering of creative genius at the dawn of human cultural development." The Côa Valley petroglyphs are comparable to the famous cave art found in other parts of Europe, says archaeologist João Zilhão of the University of Barcelona. The quantity of art in the valley suggests to him that though the cave art is more famous, it was probably less common than open-air works, many of which may have been lost to weathering.***

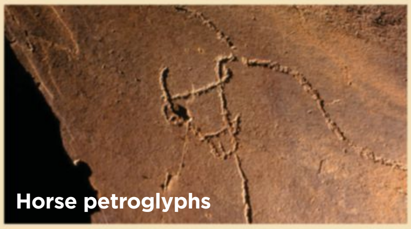
**The site**

The Côa Valley contains more than 70 discrete sites containing thousands of engravings, protected within what is now a vast archaeological park. The works at Canada do Inferno, a 400-foot canyon, were the first to be discovered. The 36 panels there, which are partially submerged due to another dam, depict ibexes, horses, fish, and aurochs, a type of massive wild ox that is now extinct. At the site of Penascosa, an artist appears to have tried to convey the idea of movement: A stallion in the process of mounting a mare is depicted with three heads that suggest he is bending down. Other sites, including Faia and Vale Carbões, have carvings that were painted or highlighted with ochre.

**Côa Valley, Portugal**

**While you're there**

The Côa Valley is in Douro wine country, which produces both table wine and port dessert wine. The Quinta da Ervamoira vineyard is within the boundaries of the archaeological park and houses a museum of the region's history. Zilhão also recommends a visit to the nearby historical village of Marialva, once a military stronghold that received the charter of the first king of Portugal, Afonso I. Of the picturesque walled village, Portuguese novelist José Saramago writes, "It is this complex of ruined buildings, and the mystery that unites them, the present memory of all those who lived here, that suddenly moves the traveler, brings a lump to his throat and tears to his eyes."



**Horse petroglyphs**

—Malin Grunberg Banyasz

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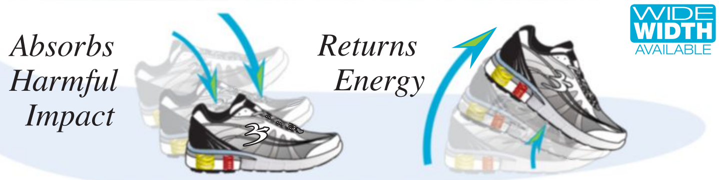

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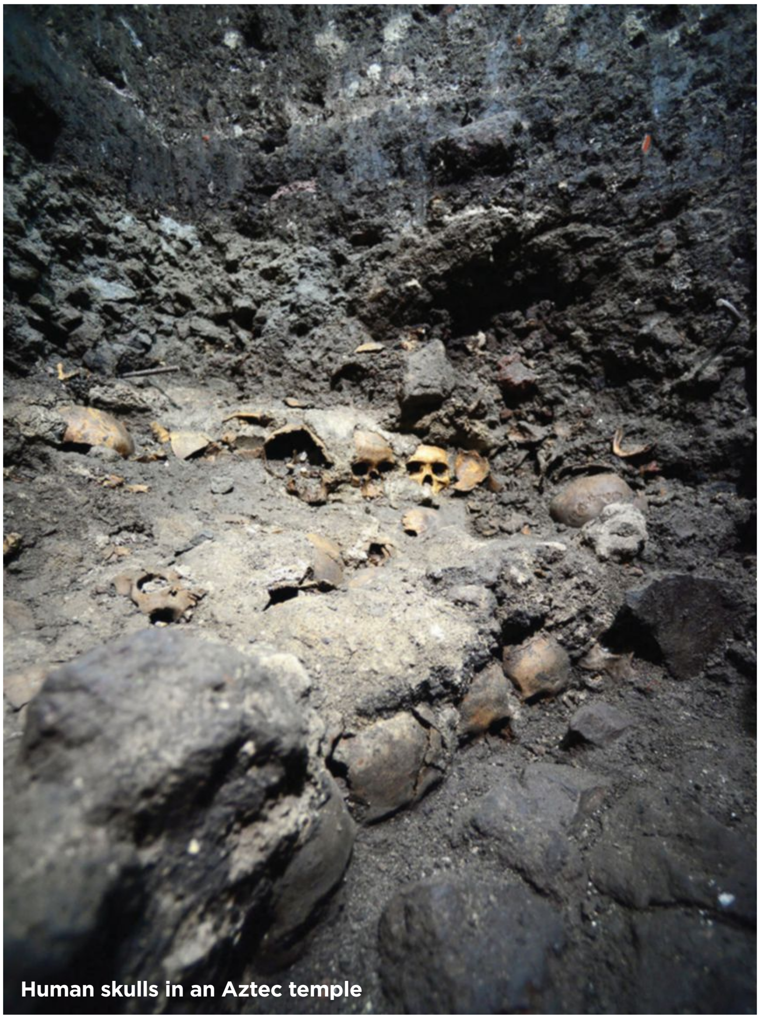
# A Circle of Skulls

The Aztecs did creative things with severed heads. Archaeologists at Mexico City's Aztec temple complex have found 35 human skulls mortared together with a mix of sand, limestone, and volcanic rock. Dating from about A.D. 1500, during a late Aztec building boom, the skulls were embedded in a circular inner wall on a ceremonial platform. Unusually, all the skulls were positioned facing the center of the platform, not toward the outside. The Aztecs were known to display heads—facing outward—on horizontal spits known as *tzompantli* to demonstrate the power of their state, whose capital, Tenochtitlán, lies under the streets of modern-day Mexico City. Almost all the skulls in the wall belonged to young men, suggesting they were captives from wars against neighboring states, says Raúl Barrera, lead archaeologist at the site. The discovery didn't come as a total surprise; Spanish chroniclers had described the grisly sight in their sixteenth-century accounts of the ancient capital. "We have found the uppermost level of the wall," says Barrera. "It's quite likely we'll find more heads at lower levels." The exact function of the ceremonial platform is not known, according to Barrera, but it was elaborately constructed with flagstones, volcanic bricks, stucco—and more human bones embedded in its outer walls.

—Roger Atwood

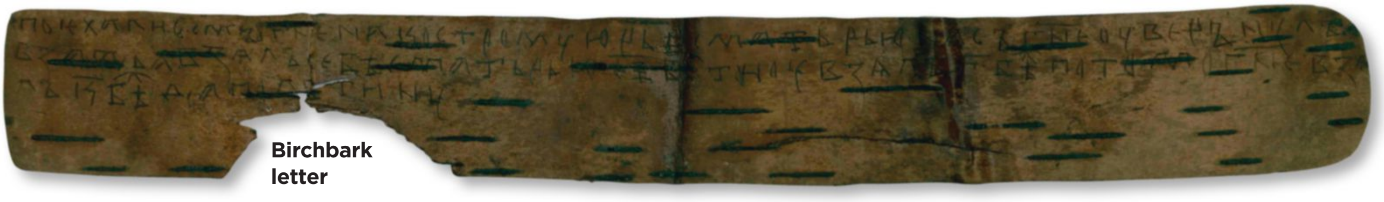


**Human skulls in an Aztec temple**

# Medieval Russian Memo

During excavation of a medieval road near the Kremlin in Moscow, Russian archaeologists recently unearthed a birchbark letter dating to the fourteenth or fifteenth century. It was probably written by a servant to his master, and describes unforeseen travel expenses he incurred on an ill-fated trip to the city of Kostroma, about 200 miles to the northeast. According to the text, somewhere along the journey he was stopped by someone named "Yuri," possibly an administrator, who fined the hapless servant twice. The letter reports that Yuri helped himself to 36 *belas*, a unit of currency at the time. "It is probably about a debt collection or an unpaid custom duty," says Leonid Belyaev of the Russian Academy of Sciences' Institute of Archaeology, who is supervising the dig. "Or maybe just extortion." This is only the fourth medieval birchbark text to have been discovered in Moscow. The other three are drafts of legal documents.

—Eric A. Powell



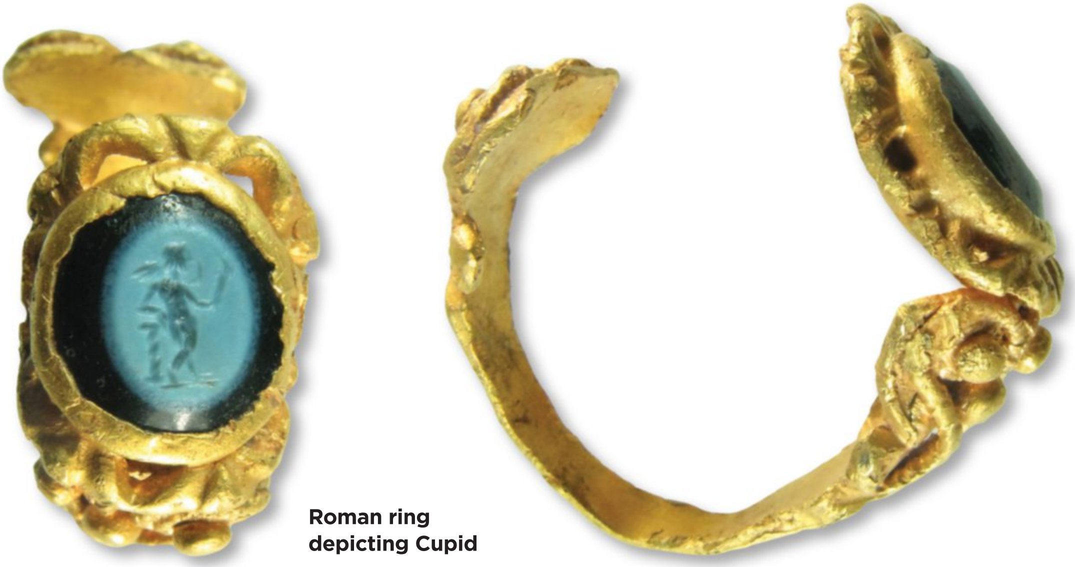
**Birchbark letter**

# The Ring's the Thing

From the iron bands that signified citizenship to those bearing a state seal and worn by the emperor, rings were the most common piece of jewelry for both men and women in the ancient Roman world.

A metal detectorist in Tangley, Hampshire, in southern England, has uncovered a late Roman example dating to the fourth century A.D., fashioned of gold and an unusual type of onyx called nicolo. The ring depicts the god Cupid, his left arm resting on a column and his right arm holding a torch, which he will use to test Psyche (in the guise of a butterfly), in an allegory of love overcoming death. In the absence of the context that comes with a complete archaeological site, it is unknown who might have worn the relatively traditional design.

—Jarrett A. Lobell



Roman ring depicting Cupid

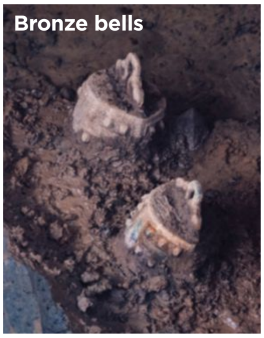
# Chinatown before the Quake

Part of an industrial sewing machine

Frenzied development in San Francisco is introducing the city's real estate and tech booms to its industrial and mercantile history. The $1.6 billion Central Subway project, which will connect Chinatown and the booming South of Market district by light rail, unearthed the latest finds: 10 late nineteenth-century industrial sewing machines, and pieces of several more, from what is thought to have been a basement room in Chinatown. The building, at 1018 Stockton Street, was destroyed in the 1906 earthquake, along with the rest of the city's original Chinatown, and archaeological remains of the neighborhood are vanishingly rare, according to Adrian Praetzellis, an archaeologist at Sonoma State University. It is hoped that archives can help connect these ornate machines with the names of the men who might have used them.

—Samir S. Patel

# Tomb from a Lost Tribe



Bronze bells

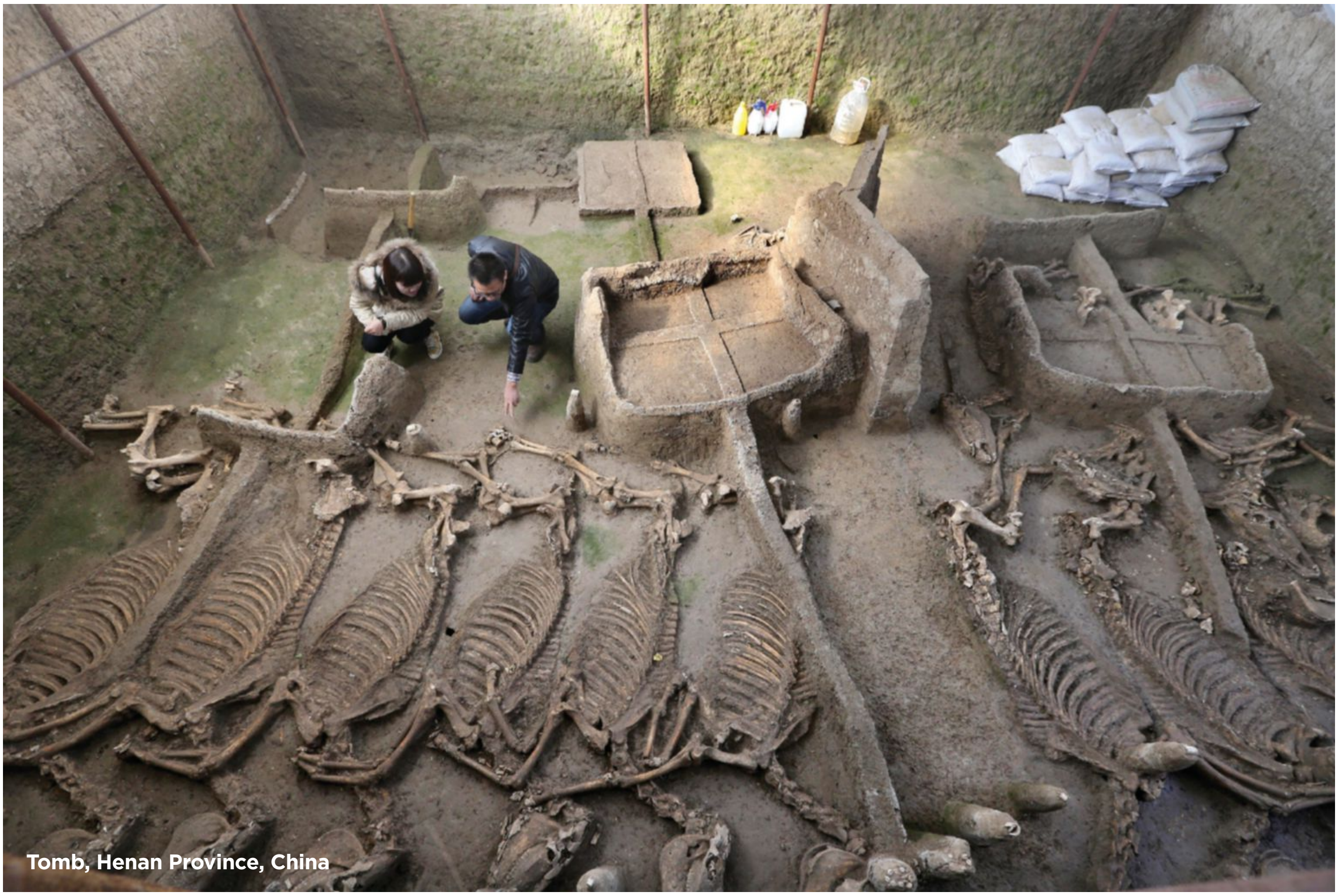
Bronze tripod vessel

Skulls and bones from cows and rams found in a 2,500-year-old tomb—discovered in a village near Luoyang, a city in China's Henan Province with particular historical significance as the capital of nearly a dozen dynasties—could indicate that the burial site belonged to the Luhun Rong, an ethnic minority tribe. The tribe, active during the Spring and Autumn Period (771–476 B.C.) of the Eastern Zhou Dynasty, was described in historic texts as barbarians, and was later eliminated during the ensuing Warring States Period (475–221 B.C.).

Conclusive evidence linking the tomb to this ethnic minority group would be significant, and some say further evidence could even link it to a completely unrecorded group of people. Chinese history is long and complex, and researchers are always working to fill gaps in certain regions. The artifacts inside the tomb, including a number of chariots, skeletal remains of horses, bronze bells, bronze tripod vessels used to hold food and wine during important rituals, and cowrie shells, may have come from as far away as the Indian Ocean or the South China Sea. The finds are also characteristic of burial traditions of royal or otherwise wealthy families from the Zhou as well as the later part of the Shang Dynasty (1600–1046 B.C.), archaeologists say.

"This is a great find," Robert Murowchick, a Boston University archaeology professor, says. "But the importance of the tomb does not hinge only on the connection to the Luhun Rong. It is important because it was found in Luoyang, where not many tombs from the Eastern Zhou period have been excavated."

—Lara Farrar



Tomb, Henan Province, China

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**- Jacqueline H.**

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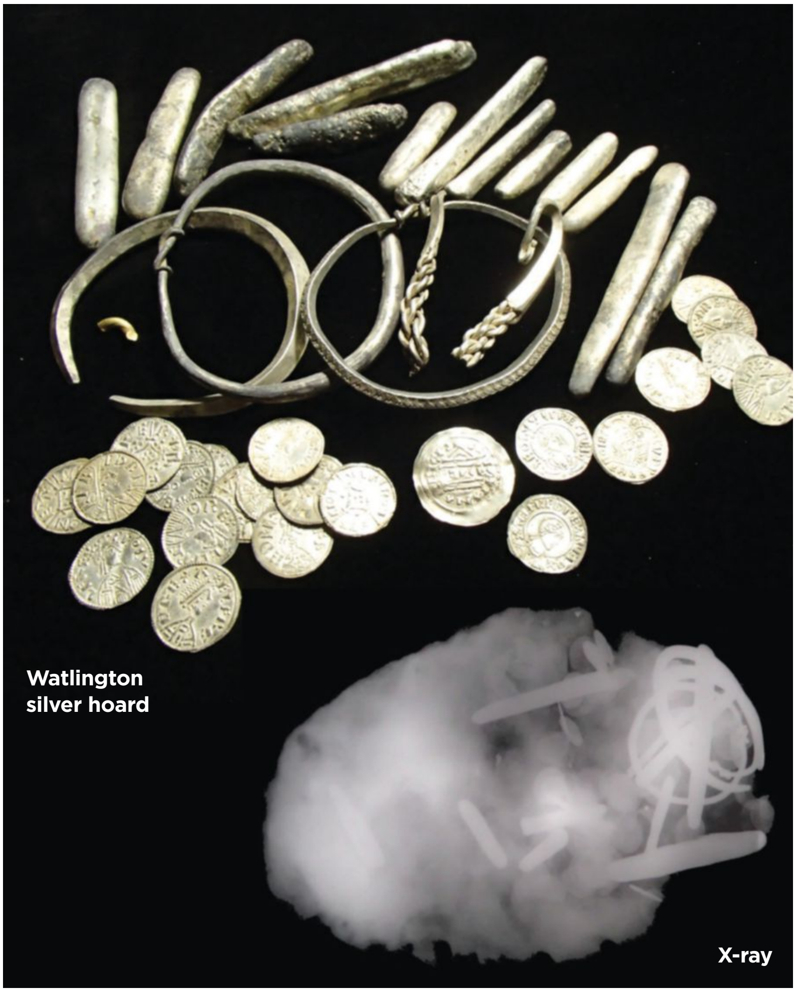
# Alfred the Great's Forgotten Ally



Watlington silver hoard

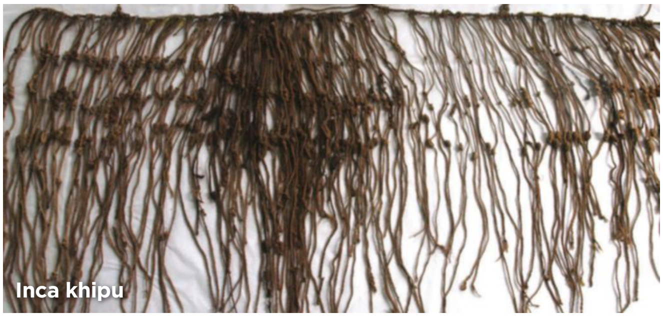
X-ray

Researchers from the British Museum recently unveiled a Viking hoard of silver that may rewrite early English history. An amateur discovered the treasure in a field in Watlington, Oxfordshire, around 40 miles west of London. The collection of more than 200 items, which includes silver coins, jewelry, and ingots, was intentionally buried in the late 870s A.D., during a tumultuous period when Anglo-Saxon armies fought to repel conquering Viking forces. In 878, King Alfred the Great of Wessex, the last independent Anglo-Saxon kingdom, finally halted the Viking invasion at the Battle of Edington. While English history portrays Alfred as one of the first great English heroes, the Watlington hoard suggests that one of Alfred's rivals, King Ceolwulf II of Mercia, may also have played a hero's role. Ceolwulf II is hardly mentioned in English historical accounts—and unflatteringly when he is—yet several of the recently discovered coins prominently depict Alfred and Ceolwulf II together. While a few examples of this minting have previously been found, this new discovery indicates that this coin was more widely produced than previously thought, and attests to a strong political alliance between the two kings. Experts now believe that Ceolwulf II may have played a significant role alongside Alfred in defending England, yet was posthumously "erased" from history by Alfred's chroniclers.

—Jason Urbanus

# Reading an Inca Archive

Archaeologists excavating an Inca storehouse at the site of Inkawasi on Peru's south coast have unearthed 34 *khipus*, the knotted-string devices once used by the Andean people for keeping records. Some khipus encode purely numerical data, while others contain deeper forms of information, such as records of historical events—but these remain undeciphered. Many of the Inkawasi khipus were found with or covered by the remains of produce, such as peanuts, black beans, and chili peppers, and it's likely they were used to keep track of those crops when they were brought to storage. Analysis of the khipus shows that some subtract a fixed value from tallies at regular intervals, and could possibly represent a state tax. Harvard archaeologist Gary Urton, who has studied the Inkawaski khipus, is hopeful that understanding the archive may eventually contribute to reading more elaborate examples.



Inca khipu

"Our income tax forms and our novels use the same alphabet. If we can learn how to read a chili pepper khipu or a peanut khipu," says Urton, "it might help us in the long run to read the khipus that record historical events."

—Eric A. Powell

# Minding the Beeswax

Recent results from a long-term study of pottery residues has revealed that farmers in the Middle East and Europe had been using beeswax for almost as long as they had made pots—but perhaps just not extensively. The discovery was made possible because of advances in techniques for distinguishing different types of lipids, naturally occurring molecules such as fats and waxes, from each other. Of thousands of sherds studied, about 80 were found to contain beeswax, indicating that it may have been a relatively scarce material in the Neolithic period, the time when people were starting to farm and make pottery.

What Neolithic people were doing with the beeswax is a matter of speculation. According to Melanie Roffet-Salque, a biochemist at the University of Bristol and leader of the research group, it may have been used to waterproof the inside of pots, or may have been deposited as wax combs were melted to extract valuable honey—one of the few sweeteners available at the time. The earliest pottery sherds containing beeswax date to the seventh millennium B.C., and were found at several sites in what is now Turkey. One of these, Cayönü Tepesi, is also where the research team previously found a pottery sherd that contains the earliest evidence of milk use.

Roffet-Salque also cautions that the presence of beeswax residue on pots does not necessarily mean that early farmers were beekeepers. They may have been harvesting wild honey and wax. The first solid evidence of beekeeping appears in an Egyptian painting from 2400 B.C., but bee products clearly have a much longer history. A lump of beeswax found among other artifacts in South Africa's Border Cave is at least 24,000 years old.

Studying pottery using this process has produced important findings about what products Neolithic people used or valued, but it has at least one drawback. "It's very time-consuming," says Roffet-Salque. "It's taken us 20 years for 6,000 sherds."

—Zach Zorich

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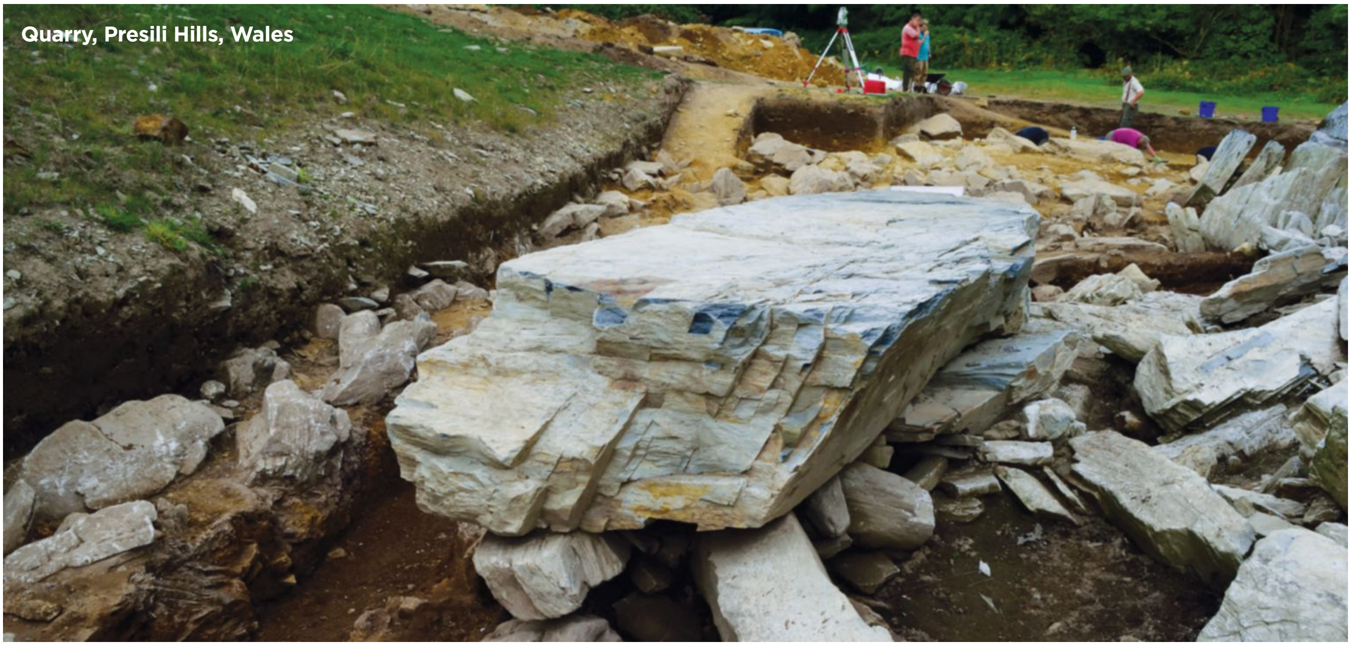

Quarry, Presili Hills, Wales

# Quarrying Stonehenge

A team of archaeologists and geologists excavating two ancient quarries in the Presili Hills of west Wales has confirmed that these sites are the sources of the 43 "bluestones" erected at Stonehenge. Weighing on average between one and two tons, these igneous and volcanic rocks were transported to Stonehenge sometime around 3000 B.C. But radiocarbon dating of charcoal discovered at quarry-related camps shows that Neolithic workers were active at the two sites some 300 to 500 years before the earliest installation of bluestones at Stonehenge. This suggests that the megaliths may have been quarried and erected in the immediate area long before they were transported to Stonehenge. "We suspect that there is a dismantled stone circle monument somewhere in the area between the quarries," says University College London archaeologist Mike Parker Pearson, who led the team. "We expect to find it and excavate it in 2016."

—ERIC A. POWELL

# A Viral Fingerprint

Researchers have extracted and characterized viral DNA from decades-old human bones for the first time—and used it to help determine the surprising origins of several long-lost casualties of war. The bones, which belonged to 106 soldiers killed in World War II, were retrieved over the past two decades from the forests of Karelia, in present-day Russia. The researchers found DNA of parvovirus, a common childhood affliction, in the remains of nearly half the soldiers.

The bones included in the study are thought to have all belonged to Finns, but the type of parvovirus found in the bones of two of the soldiers has never been known to occur in northern Europe. A closer look at these soldiers' own genetic material revealed sequences that tend to be found in parts of Asia and areas to the south, suggesting that the soldiers were part of the Soviet Red Army. "This shows that viral genetic sequences—in addition to human genetic sequences—can be used as a geographical fingerprint," says Klaus Hedman, a clinical virologist at the University of Helsinki, "providing a means of identifying people's origins."

—DANIEL WEISS

Removal of bone samples

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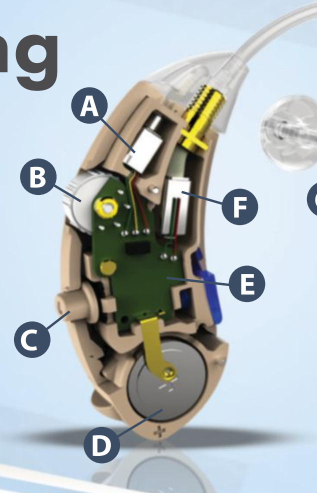

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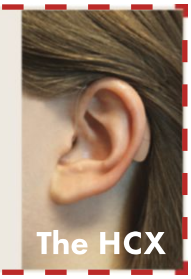

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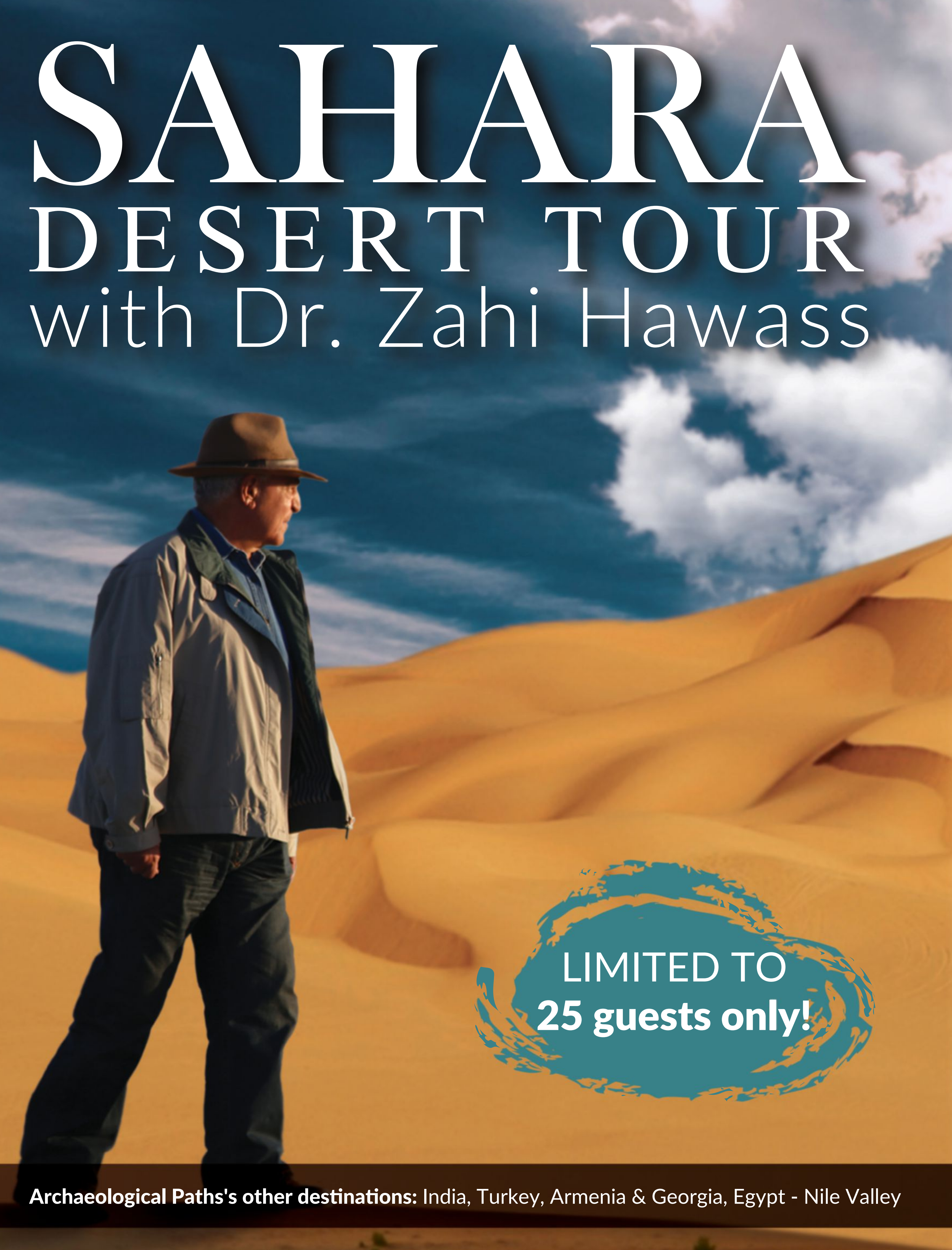

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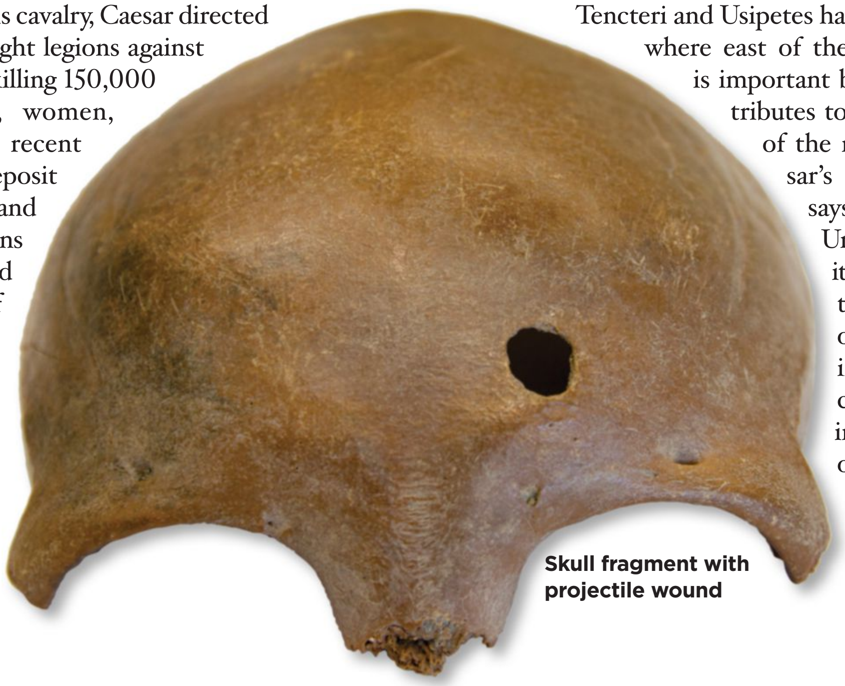
# Caesar's Diplomatic Breakdown

Dutch archaeologists have examined archaeological, historical, and geochemical data to pinpoint the site of a catastrophic battle between Julius Caesar and two Germanic tribes, the Tencteri and Usipetes. According to the *Commentarii de Bello Gallico*, Caesar's firsthand account of the campaign, the two tribes crossed the Rhine River in 55 B.C. and petitioned Caesar to allow them to settle in Gaul. After negotiations collapsed and the Germans attacked his cavalry, Caesar directed his entire army of eight legions against the German camp, killing 150,000 to 200,000 men, women, and children. The recent study analyzed a deposit of metal artifacts and human skeletal remains that was retrieved during dredging of the Meuse River near the village of Kessel in the Netherlands. The mass of first-century B.C. weaponry, including swords, spearheads, and helmets, as well as the condition and radiocarbon dates of the bones, seem to confirm the site of the slaughter. Some of the skeletal remains bear holes and other marks of violent trauma. Scholars believe that the Romans may have dumped the battlefield remnants in the river after the fight. Geochemical analysis of the dental enamel of three individuals also indicates that they were not native to the Dutch river area, confirming Caesar's own account that the Tencteri and Usipetes had emigrated from somewhere east of the Rhine. "This research is important because it not only contributes to a better understanding of the military history of Caesar's Germanic campaigns," says Nico Roymans of VU University Amsterdam, "but it also informs us about the highly violent nature of the Roman conquest, including cases of genocide, and the dramatic impact it must have had on the indigenous societies in this frontier zone."

—Jason Urbanus



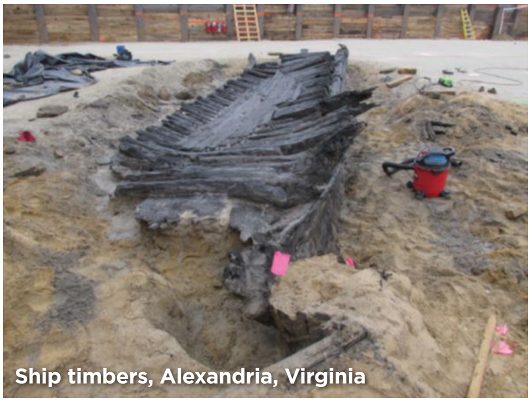
**Skull fragment with projectile wound**

# Ship Underground

A large portion of an eighteenth-century ship that measured around 80 feet long was recently discovered on the site of a planned hotel near the Potomac River in Alexandria, Virginia. The vessel appears to have been scuttled between 1775 and 1798 in what were then mud flats, where it served "as sort of a prebuilt framework to hold soil that was being deposited to make new land," says Boyd Sipe, manager of Thunderbird Archeology, the firm that conducted the survey. Based on its size and evidence that its hull timbers had contact with salt water, Sipe says the ship was most likely a two-masted oceangoing heavy cargo or military craft.

The timbers were particularly well preserved because, once buried, they were sealed off from oxygen and were not disturbed despite extensive construction in the area in the nineteenth and twentieth centuries. At the site, archaeologists have also discovered the remains of Alexandria's first public warehouse, dating to the 1750s, and three privies containing extensive artifacts including a complete kaolin pipe, jewelry, ceramics, glass bottles, and parts of leather shoes.

—Daniel Weiss



**Ship timbers, Alexandria, Virginia**

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# WORLD ROUNDUP

**ALASKA:** Ships' captains have always relied on experience and intuition to keep cargo, passengers, and crew safe. But sometimes the sea is inscrutable, such as in 1871, when the captains of 33 whaling ships counted on a wind shift to drive ice out to sea. The wind refused, and the fleet was destroyed by pack ice in just weeks, stranding more than 1,200 people—all of whom were rescued. Maritime archaeologists have now found the remains of two of those ships, in part because climate change means less ice and more access to Arctic wreck sites.

**FLORIDA:** In 1559, Spanish nobleman Don Tristán de Luna y Arellano established the first multiyear European settlement in the United States, in what is today Pensacola. Undone by bad luck, bad planning, and bad weather, the settlement lasted two years. Two shipwrecks from the ill-fated colony have been found and studied ("Sunken Dreams," November/December 2010), but until now the location of the settlement itself was unknown. The discovery of mid-16th-century Spanish artifacts now has archaeologists convinced they have identified the long-lost site, within sight of the wrecks.

**ENGLAND:** On Church Cliff Beach in Lyme Regis, a beachcomber recently found a small metal token inscribed "MARY ANNING MDCCCX" on one side and "LYME REGIS AGE XI" on the other. Anning is a legend in paleontology—discoverer of the first *Ichthyosaurus* and the first nearly complete *Plesiosaurus*. Researchers suspect the token might have been a lost gift from her father, a cabinetmaker and the source of her passion for fossil-collecting, on the occasion of her 11th birthday, in 1810, the same year he died.

**NEW MEXICO:** The "great houses" built by Puebloans in Chaco Canyon may appear, at first glance, to be made of stone alone, but wood was just as important a building material. Using a technique called dendroprovenance, researchers can now trace the wood, from 240,000 trees, to two mountain ranges, each about 50 miles away. Before A.D. 1020, most came from the Zuni Mountains to the south, but after 1060, it came from the Chuska Mountains to the west. The switch coincided with a flourishing of Chacoan culture.

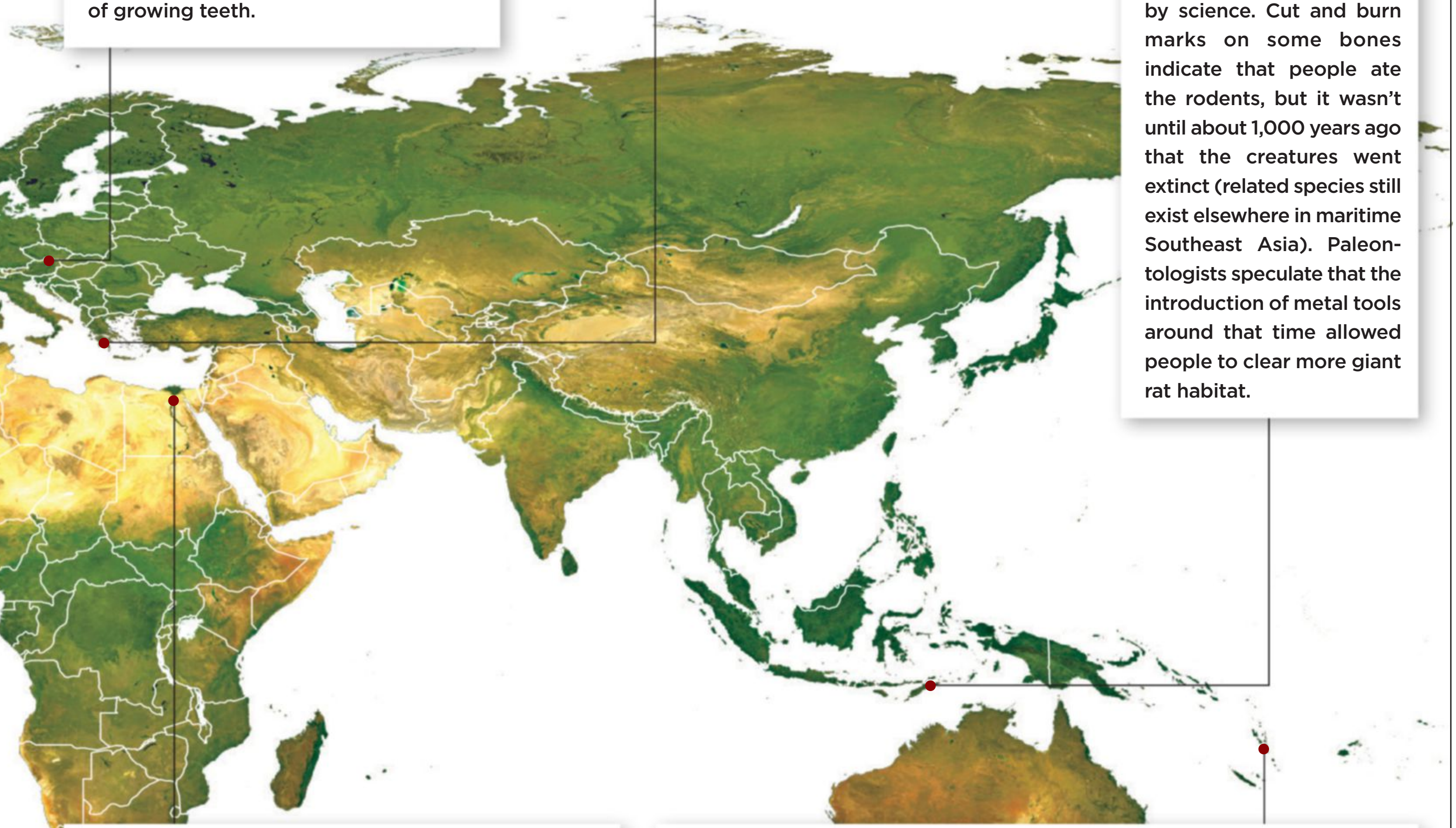
**CAPE VERDE:** "It now presents a melancholy, but very picturesque appearance....We visited a collection of buildings, of which an ancient church formed the principal part," Charles Darwin wrote of his visit to Cidade Velha, former capital of what was then a Portuguese trading colony. Researchers have found the remains of a 500-year-old church that may have been the one he visited. It is the oldest building in the islands, and the oldest known European church in the tropics. As many as 1,000 people, many of them African slaves, are likely buried beneath.

By Samir S. Patel

**AUSTRIA:** It had once been assumed that Christopher Columbus brought syphilis back to Europe from the New World. That theory has been challenged, and now may be quite dead, as osteologists have found evidence of congenital syphilis—which is passed from pregnant mother to unborn child—among remains buried under the cathedral square in St. Pölten, dating to the early 15th century. The disease was identified by telltale changes to the shape of growing teeth.

**GREECE:** It can be surprising to think of Greece outside of the context of the classical world, but it has clearly been occupied for ages. The recent excavation of the site of Marathousa 1 has revealed exceptionally preserved animal remains and stone tools from roughly 300,000 to 600,000 years ago, including the butchered remains of a *Palaeoloxodon antiquus*, a straight-tusked elephant that could grow up to 13 feet tall.

**EAST TIMOR:** For 45,000 years, people on Timor coexisted with the biggest rats the world has ever known, some upwards of 10 pounds. A project there found new fossils from several giant rat species previously undocumented by science. Cut and burn marks on some bones indicate that people ate the rodents, but it wasn't until about 1,000 years ago that the creatures went extinct (related species still exist elsewhere in maritime Southeast Asia). Paleontologists speculate that the introduction of metal tools around that time allowed people to clear more giant rat habitat.

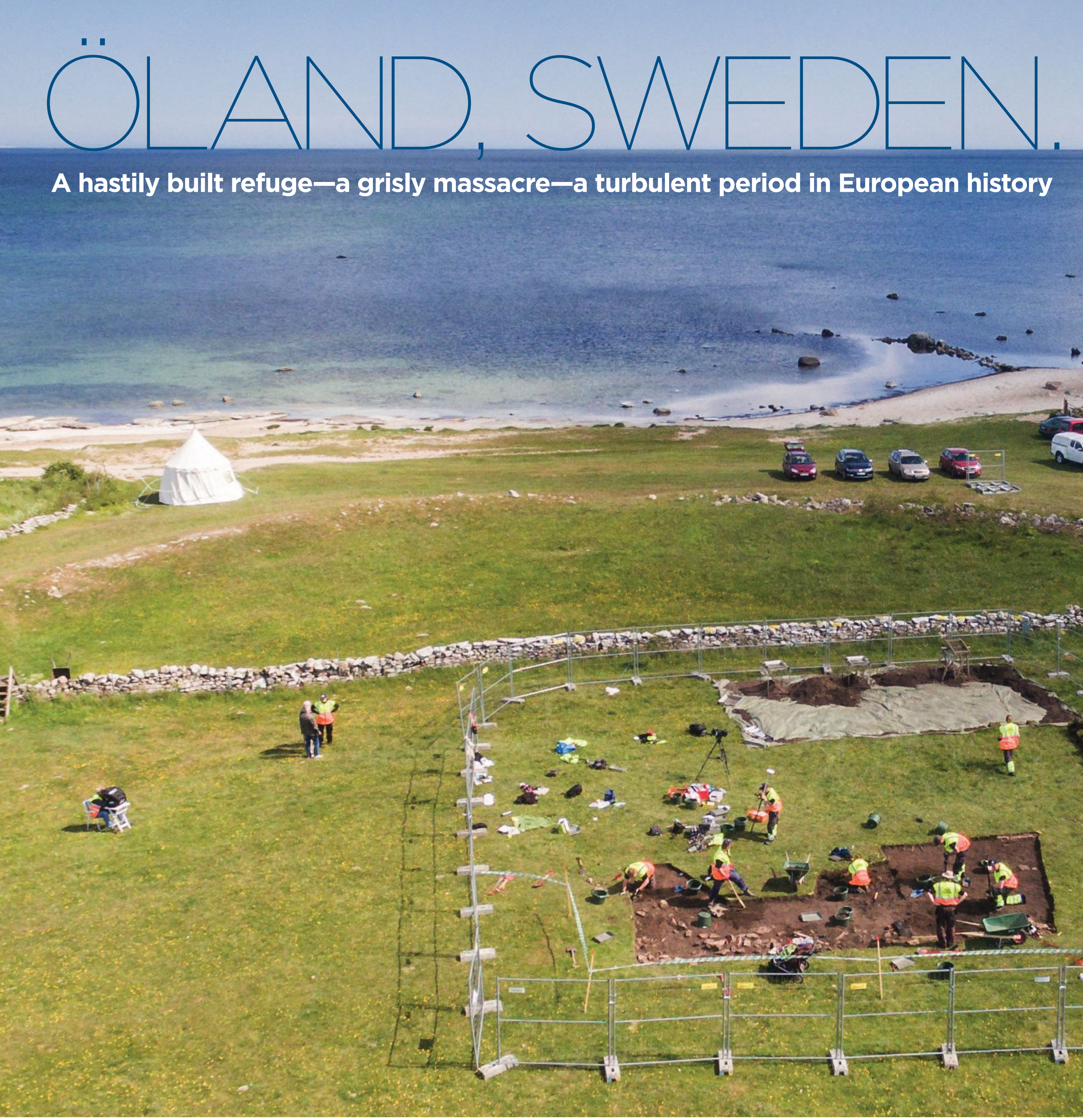


**EGYPT:** It took eight weeks of delicate surgery—using some traditional materials—but the mask of Tutankhamun is now back on display at the Egyptian Museum after its long beard was knocked off by museum workers and then hastily reattached using epoxy resin. The concern was that the clumsy, crusty repair job would be irreversible, but an international team removed the epoxy with wooden tools and has reattached the beard with beeswax.

**VANUATU:** Analysis of seven 3,000-year-old skulls from the oldest cemetery in the South Pacific, on Efate, an island in Vanuatu, is helping explain how the region was settled. The people of this island nation today resemble Melanesians—natives of Australia and New Guinea—more than Polynesians, such as natives of New Zealand and Hawaii. Osteological data are showing that a people called the Lapita, who first colonized the Pacific, looked more like Polynesians. Melanesians apparently came later and the groups intermarried. In places such as Vanuatu and Fiji, Melanesian traits won out, while Polynesian ancestry dominated elsewhere, as people island-hopped to the east.

# ÖLAND, SWEDEN.

## A hastily built refuge—a grisly massacre—a turbulent period in European history



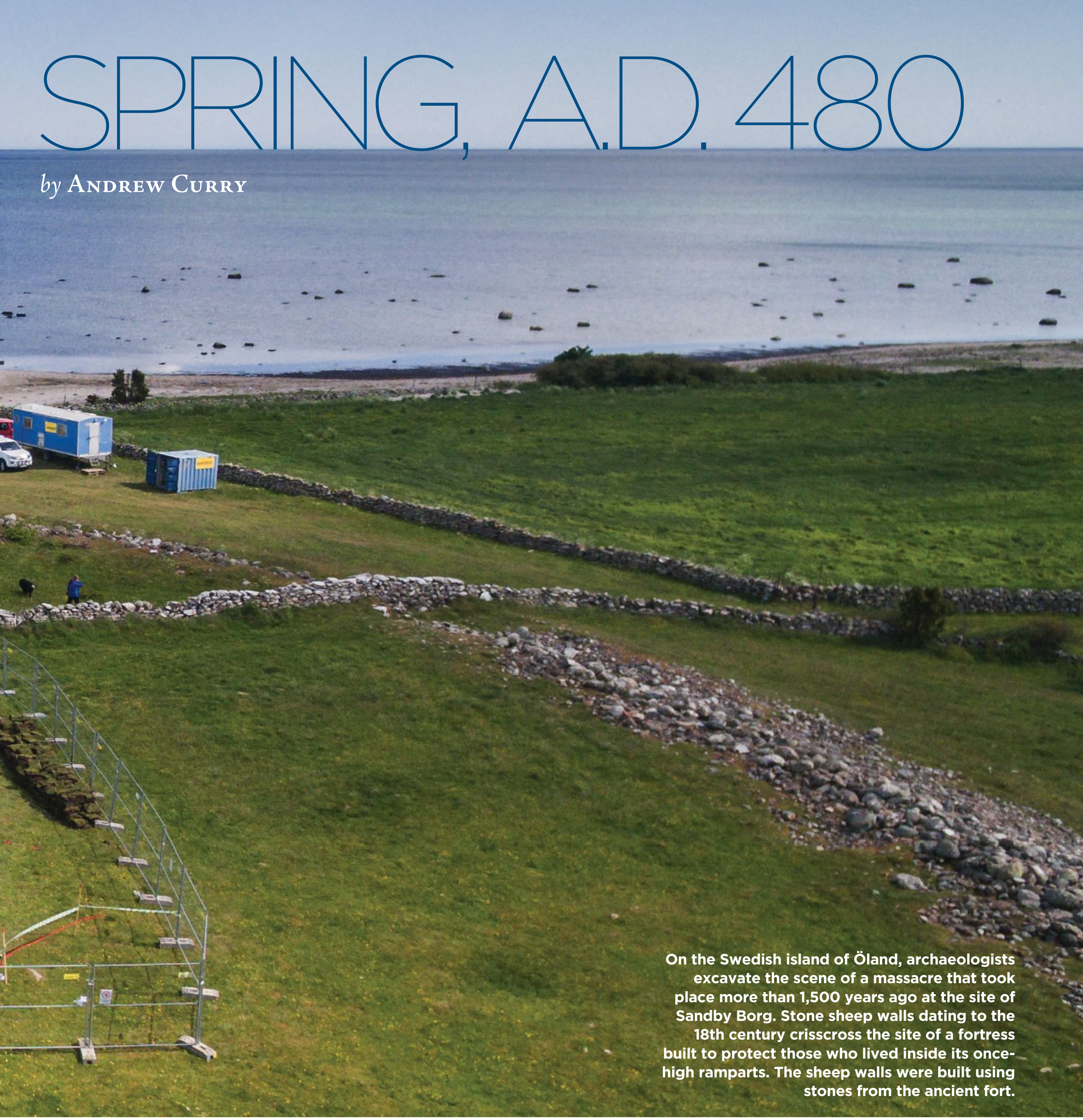
THE SCENE MIGHT HAVE been lifted from the pages of a Scandinavian crime novel: Under a steely sky, a half-dozen skeletons emerge from the cold, wet earth. A strip of yellow and blue tape, fluttering in the wind blowing in from the Baltic Sea, holds back curious onlookers. Portable fences, the kind that go up around construction sites, form a protective ring-within-a-ring around the scene. Yellow plastic stakes mark the spots where bodies, some with clear evidence of brutal blows to the head with an ax or other edged weapon, have already been found.

Slowly, trowelful by trowelful, a 12-person team of investigators is excavating the scene of a gruesome mass murder on Öland, an island several miles off the coast of Sweden. In the last five years, they've found body after body, sprawled out with many of their bones shattered, on the rough limestone slabs and gravel floor of a 1,500-square-foot house. But it's a cold case.

The floor is part of a house—the scene of the crime—sur-

# SPRING, A.D. 480

by Andrew Curry



On the Swedish island of Öland, archaeologists excavate the scene of a massacre that took place more than 1,500 years ago at the site of Sandby Borg. Stone sheep walls dating to the 18th century crisscross the site of a fortress built to protect those who lived inside its once-high ramparts. The sheep walls were built using stones from the ancient fort.

rounded by an oval ring of stones and earth, the remains of what was once a wall. Built around A.D. 400, it encircled an area the size of a football field. Now called Sandby Borg, the site is one of more than a dozen similar "borgs," or forts, on Öland, all built during the Migration Period, a tumultuous era in Europe that began in the fourth century A.D. and hastened the collapse of the Roman Empire. The forts were like safe rooms in case of a siege or surprise attack and could be reached within a few minutes at a dead run from surrounding farms. Sandby Borg's 15-foot-high ramparts once protected 53 houses and their stores of food. What remains of Sandby Borg's walls now surround a flat expanse of grass, and aren't even tall enough to break the strong winds. But 1,500 years ago, Sandby Borg would have been impossible to miss.

Despite its defensive advantages, its end was violent and swift. In a sudden onslaught not long after its construction, its residents were slaughtered, with just enough warning before the attack to hide their valuables. Their bodies were left where they lay, on the floors of their homes and even in smoldering fire pits. The houses were closed up and the place was abandoned. It wasn't looted after the murders, and neighbors on the densely populated island didn't interfere with the site, so archaeologists believe that the area was considered taboo for years after the attack.

As the turf walls of its houses collapsed, Sandby Borg became a shallow grave, with bones concealed just inches below the surface. It's unique, says Helena Victor, an archaeologist at the Kalmar County Museum on the mainland just across from the island, because the attack and destruction were so sudden, and the site was never resettled. "This intact moment of an ordinary day is very important, because we know so little about daily life at this time," she says.

The Sandby Borg project began in 2010 in response to the threat of looting. Researchers at that time had little idea of what they would actually find. Archaeologists testing geophysical prospecting methods in the area noticed that treasure hunters had recently dug pits around the fort, perhaps looking for gold coins. Professional metal detectorists were mobilized to search for anything the looters had missed. They uncovered five different jewelry stashes from houses at the center of the fort. The caches include silver brooches and bells, gold rings, and amber and glass beads. There were even cowrie shell fragments, pierced to be strung on a necklace.

The deposits weren't randomly placed. Each one was buried just inside the doorway of a house, to the left of the door. Victor, who directs the Sandby Borg excavation, immediately suspected that foul play was behind this arrangement. Her theory was that the women of the fort buried their valuables in predesignated spots. "It's possible there was an agreement amongst the women—'if something happens to me, here's where you'll find it,'" Victor says. To identify five separate deposits, Victor goes on to explain, is a sign that "something terrible must have happened. These are things you don't forget or leave behind. Right away we realized they had all died."

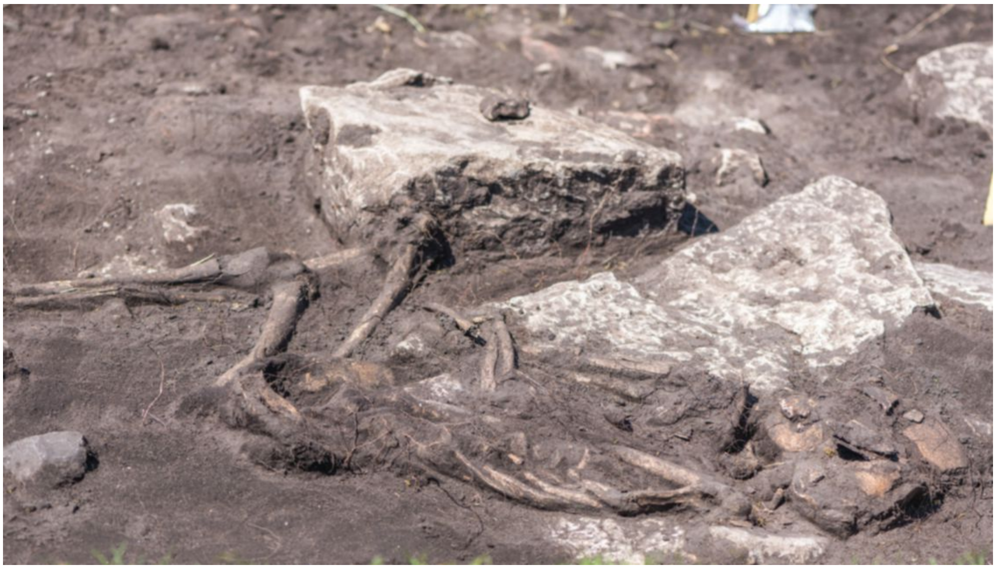
Her curiosity piqued, Victor returned to the site in 2011. At that time, she dug three test pits, including one in House 40, a large dwelling in the middle of the fort in which the biggest jewelry stash had been found. On the last day of the weeklong dig, excavators made the grisly discovery of two human feet.

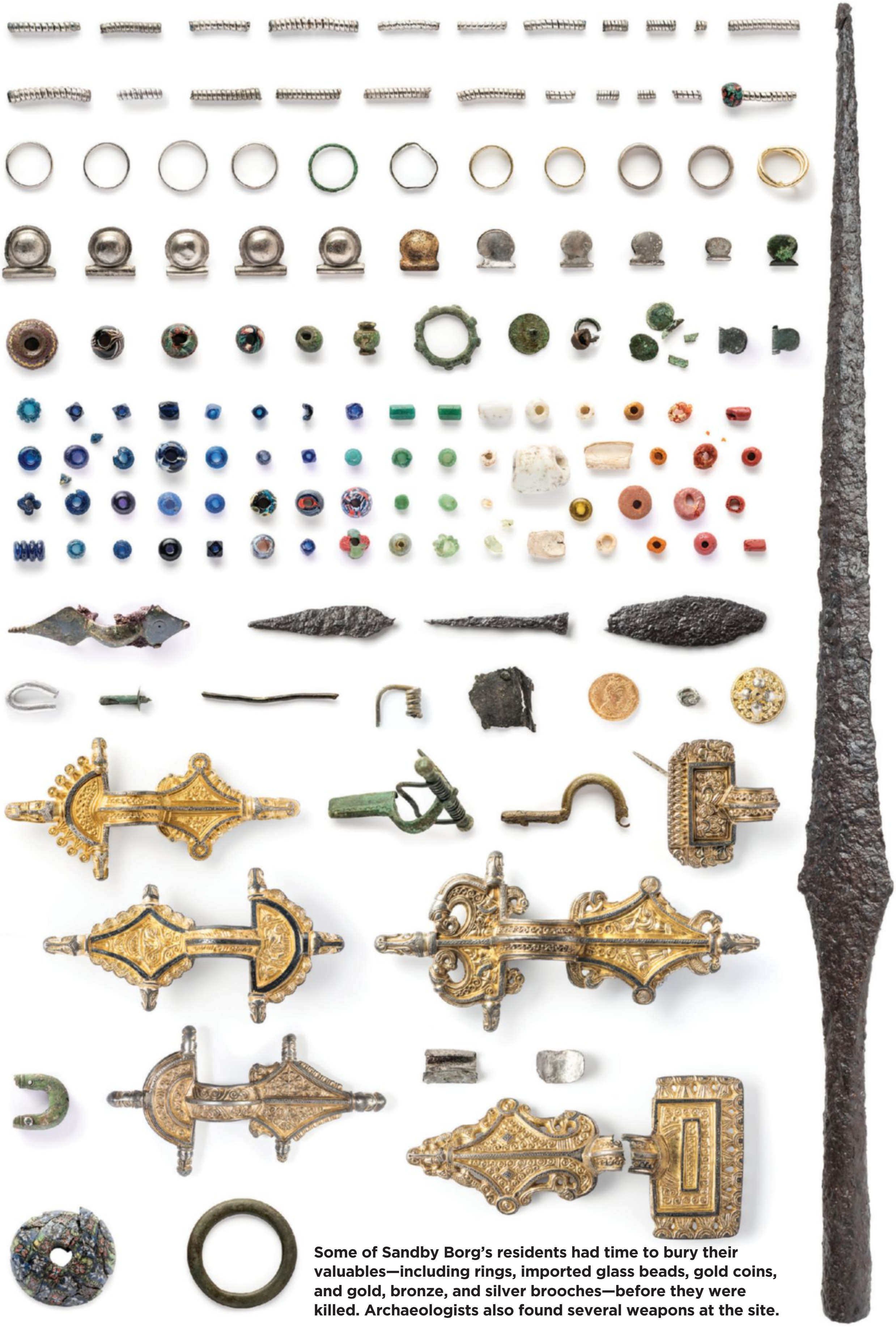
The following year, Victor and her team went back to Sandby Borg and uncovered the rest of the skeleton. It was a man in his late teens, lying on his back. His skull had been split clean open by an ax or sword. To have been hit with that much force in the low-ceilinged houses of the fort, the victim must have been kneeling, his death an execution. Next to him was another young man, lying facedown.

In Sweden, excavations are only funded in case of emergency; for example, if a site is about to be damaged by construction. Because there was no such threat at Sandby Borg, Victor had to scrape together funds for more small digs in the summers of 2013 and 2014. In 2014, they found the partially burned bones of an older man, facedown on top of a hearth. That the body was burned down to the bones in places suggests he was dead when he fell—otherwise he would have moved. "We make these assumptions sometimes," Victor says. A child's leg bone was also found not far from the older man, as though more evidence were needed that this had been no ordinary day. "It could have been a grandfather and his grandchild," Victor says. "It's a very clear sign someone killed everyone in the fort. Normally, raiders take the children with them [as captives]." The violent deaths deepened the mystery of Sandby Borg—and Victor's determination to continue digging, at least until House 40 had been fully excavated.

When Sandby Borg was built, Öland must have been a risky and possibly terrifying place to live—it has a seemingly endless coastline for seaborne raiders to land on and no natural barriers to slow down attackers. Even today, the island can be a strange, forbidding place. Twenty times bigger than Manhattan, it is flat, windy, and barren. Yet none of this has stopped people from settling there. The earliest signs of human habitation date back millennia, and the island is still dotted with Bronze Age burial mounds and Viking runestones.

Two thousand years ago, Öland was connected to the mainland by the Baltic, and from there to the Mediterranean via established overland trade routes. Ölanders profited greatly from long-distance trade with the rest of Europe. Archaeological excavations and chance finds have turned up hundreds of Roman coins, bronze statues, glass beads, and vessels dating to the first four


Shattered skeletons of the massacre's victims were found inside their houses, still lying on the flagstones where they had been killed.



Some of Sandby Borg's residents had time to bury their valuables—including rings, imported glass beads, gold coins, and gold, bronze, and silver brooches—before they were killed. Archaeologists also found several weapons at the site.

centuries A.D., when Öland had extensive contact with the Roman Empire.

As the empire began to decline, Scandinavian warriors from the islands of Bornholm, Gotland, and Öland found that a set of skills different from what they had sharpened before was now in demand. They had traveled thousands of miles south between A.D. 350 and 500 to work as mercenary bodyguards for the last of the Roman emperors, who paid well to guarantee their loyalty. Ölanders had long brought their wages back to the windswept Baltic island in the form of Roman *solidi*, gold coins commonly issued in the late empire. The solidi found on the island are distinctive, matching dies that have been uncovered in Rome. "A lot of them are very fresh, in mint condition," Victor says, without the characteristic wear of coins that have been passed from hand to hand in trade. "There's a direct link to Rome, and later to Milan and Arles."

If gold is any measure—and there's every reason to think it was, considering the tiny holes Öland's mercenaries drilled in their solidi to check the purity of the gold, and the high concentration of coins found on the island—Sandby Borg was home to some of the island's most successful warriors. "When we mapped the solidi found on the island, 36 percent were within a mile or so of Sandby Borg," Victor says.

**Excavating at Sandby Borg is particularly painstaking because of the complex challenge presented by the discovery of so many human remains at the site.**

Then, around A.D. 450, the gold began to run out. The Western Roman Empire was at an end, and there were no emperors left who could pay for imported bodyguards. The latest dated solidi archaeologists have found on the island date to around this time. Archaeological evidence suggests that Öland's social harmony collapsed along with its economy. Suddenly, the island was full of unemployed soldiers, all of them fingering their swords and eyeing their neighbors' shining gold and imported glass beads. To protect themselves, people had already begun to build ringforts. In a phenomenon that seems to have been limited to Öland, small farms and hamlets were moved to be closer to the safety of walled borgs that were built to withstand serious assaults. The forts had high earthen walls and gates built using techniques brought home from Rome, with signs of crenellated ramparts and arched gates. The houses were arrayed in a circle along the inner wall and with a central block of houses in the middle. Archaeologists have identified at least 16 borgs on the island, all built at roughly the same time using nearly identical plans.

Much of what archaeologists know about Öland's ringforts comes from a 1960s dig at Eketorp, a ringfort about 20 miles from Sandby Borg that's now an open-air museum. As the island's society crumbled in the Migration Period, many Ölanders abandoned their scattered houses and took up permanent residence behind the tall turf walls of the island's borgs. Eketorp had been occupied for centuries, from around the same time Sandby Borg was built, to well into the Middle Ages. "After work at Eketorp, the argument was that there wasn't much more to learn about forts on Öland," says Ulf Näsman, a Swedish archaeologist who led the Eketorp excavation decades ago and is now a professor at Linnaeus University in Kalmar. "Then came these finds."

Sandby Borg's story is, in fact, very different from Eketorp's. What archaeologists call the "cultural layer" inside the fort, the accumulated trash and debris of daily life, is thin. People lived there for a few months, at most, using it as a shelter rather than a home. "It was obviously built as a refuge and never really occupied," says Näsman, who is helping excavate House 40's hearth. That's a sign that the community that sought protection behind Sandby Borg's once-mighty walls was an early loser in the unrest that tore the island apart. "When the power struggle started, we think people moved into the fort and brought everything with them," says Victor. "And then everything stopped. Nothing happened after this massacre."

Though speculating on how and why the massacre took place is captivating, the event itself is perhaps less important to archaeologists than its suddenness. Because life in the fort was extinguished so abruptly, the site has the potential to illuminate details of daily life in Scandinavia around A.D. 480. The fact that the fort wasn't looted or burned afterward makes it even more interesting. The killers seem to have left the bodies of their victims where they fell, and then departed, never to return. "It's compelling because people were killed inside the houses, and then the killers went out, locked the doors, and left," says Näsman.

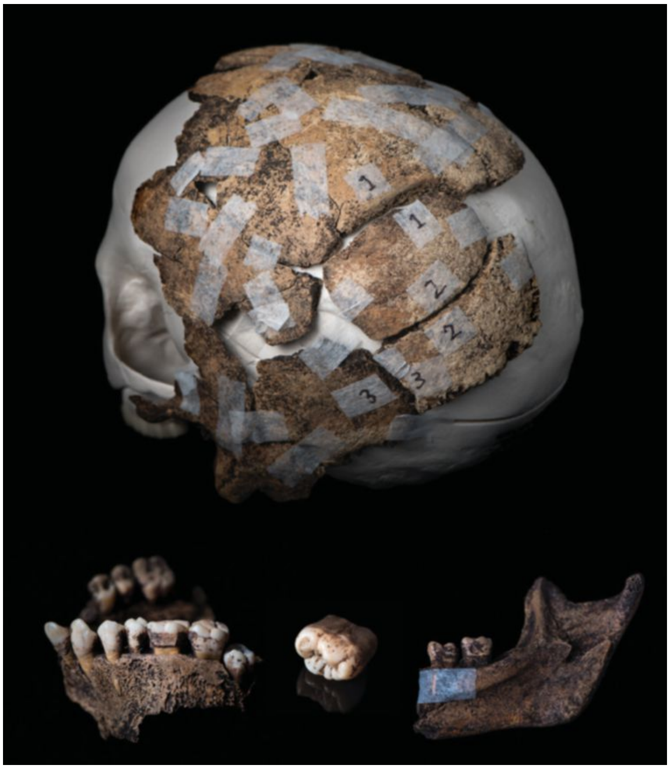
As archaeologists have explored House 40, they've uncovered some fascinating details. The team has found lamb bones that place the fort's final days in the spring. Grains of rye and the earliest mustard seeds yet found in Scandinavia hint at what else might have been on the table. "We've even found the skeleton of half a herring, perhaps part of a last meal," says Victor. "It's a kind of frozen moment you almost never have." Clara Alfsdotter, an osteologist at the Bohusläns County Museum in Uddevalla, Sweden, took soil samples from near the stomachs of several skeletons and will send them to a lab in Stockholm. "Hopefully we can see what they consumed before they died," she says.

For now, though, bodies keep getting in the way. Human remains are complicated and time-consuming to excavate. Part of the reason it's taken nearly five seasons of digging (albeit only a week or so at a time) to fully explore just one house is that more bodies keep turning up. As clouds and sunshine alternate on a cold June day, Kalmar County Museum archaeologist Frederik Gunnarson squats in the middle of a shallow trench that cuts through the middle of House 40. Bones have been emerging all morning, including what looks like a child's vertebra, and the team is under pressure. "We've got eight people's bodies here, and six of them are new," he says. "And we've only got two days of digging left. It's time to make some operational decisions."

Just two percent of the fort's interior has been excavated. But the dramatic evidence of slaughter there suggests there may be hundreds more people within the fort's oval ring wall. "The thing is, this is not the only house," says Ludvig Papmehl-Dufay, another archaeologist at the Kalmar County Museum. "There must be dead people in the other ones as well. This was quite an attack."

The most intuitive explanation for such a massacre would be a major battle or siege. At Eketorp, archaeologists found evidence that one of the fort's gates was badly burned, and the area outside was littered with arrowheads, strong evidence for a failed attack on the fort. But at Sandby Borg, metal detectorists found nothing outside the fort's walls, likely ruling out a siege or violent assault. And the human remains the team has found thus far are strangely bare—most of the artifacts found were hidden or buried, apparently before the attack. "There is no dress, such as belt buckles [on the skeletons]," Näsman says. "Were they caught unawares at night? Maybe they were nude or in night dress and taken by surprise."

The assailants didn't even take the animals. The team has found skeletons of lambs, pigs, and even a horse inside the fort. "Horses are some of the most popular booty, but they left the horse and pigs and lambs behind," Victor points out. "It's not normal behavior." The animals seem to have been locked in and eventually starved to death. Victor argues that the curious abandonment is a sign that the Sandby Borg massacre was perpetrated by someone on the island. "If somebody had attacked from across the sea, residents of Sandby Borg's neighboring villages would have come and buried them, or at least nicked their sheep," she says. "There was a struggle on the island, and this is humiliation beyond death. Killing someone is one thing, but forbidding burial is a real demonstration of power."



**Among the remains found at Sandby Borg is a skull that had been shattered into more than a dozen pieces, in addition to knocked out teeth and fractured jaws.**

As if the gruesome circumstances of the deaths weren't enough, two of the bodies were found with sheep or goat teeth in their mouths, a nasty twist on the coins typically deposited to smooth a warrior's way into the afterlife. "It wasn't enough to kill them and leave them in their houses," Victor says. "It's really, really ugly treatment." Whatever happened at Sandby Borg seems to have left a lasting scar on the island. Villagers in nearby Gårdby remember being told by their parents not to play near the fort's ruins, and, according to local legend, the town's churchyard is haunted by ghosts from Sandby Borg.

With help from the Kalmar County Museum, the 2015 excavation was extended a few more days, long enough to fully excavate House 40. The final body count: eight people, including a child between two and six years old. Added to the remains found in neighboring houses, there are 14 known victims of the attack on Sandby Borg. Victor hopes that what she's found so far, and future research at the fort, will illuminate not just how they died, but also how they lived. Ultimately, that may be a more lasting contribution than the details of the fort's final hours. After all, "there's nothing to compare it to," Victor says. "There's no 'normal' massacre." ■

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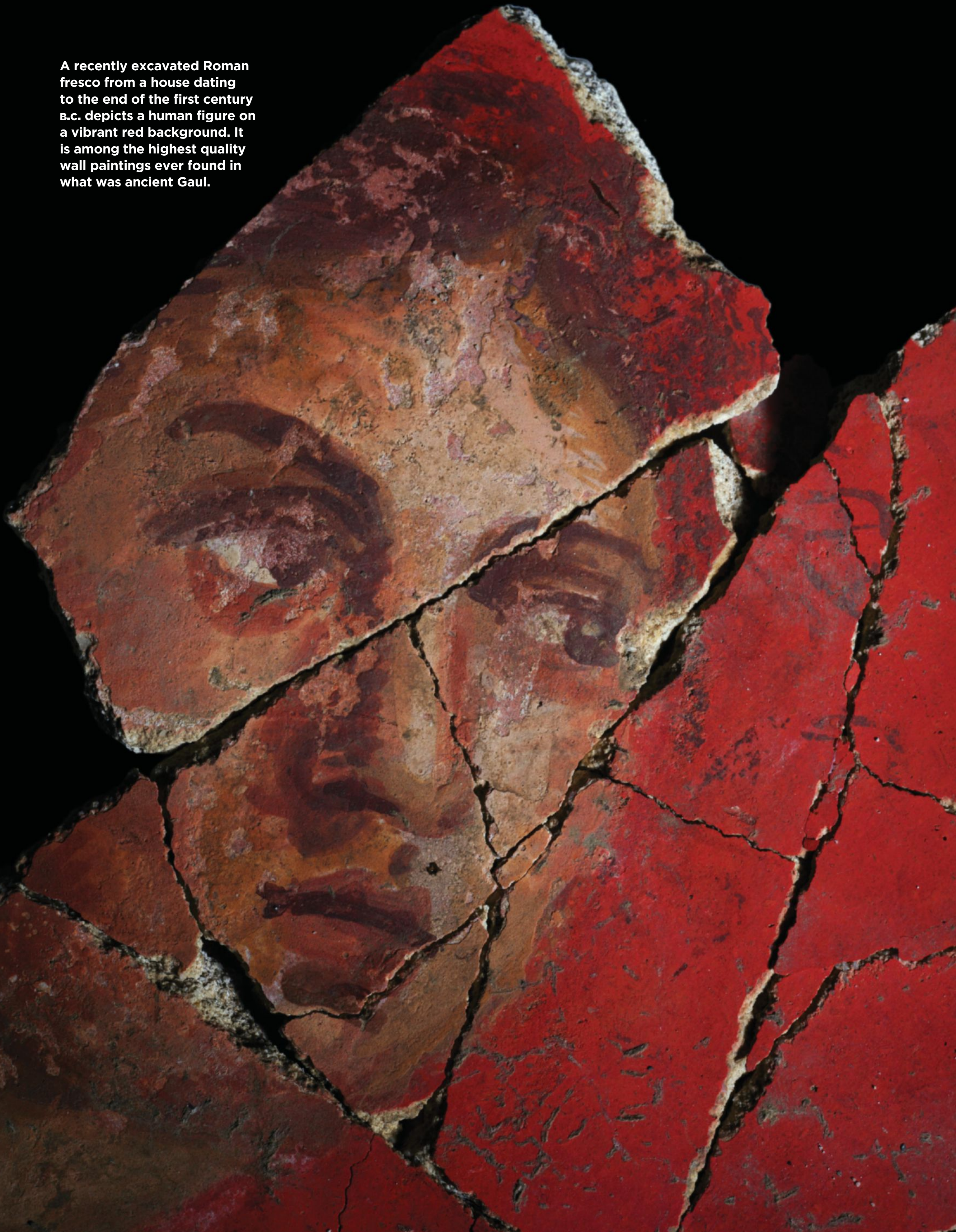
**Andrew Curry** ***is a contributing editor at*** **Archaeology.**



A recently excavated Roman fresco from a house dating to the end of the first century B.C. depicts a human figure on a vibrant red background. It is among the highest quality wall paintings ever found in what was ancient Gaul.

# FRANCE'S ROMAN HERITAGE

## Magnificent wall paintings discovered in present-day Arles speak to a previously unknown history

*by* Jason Urbanus

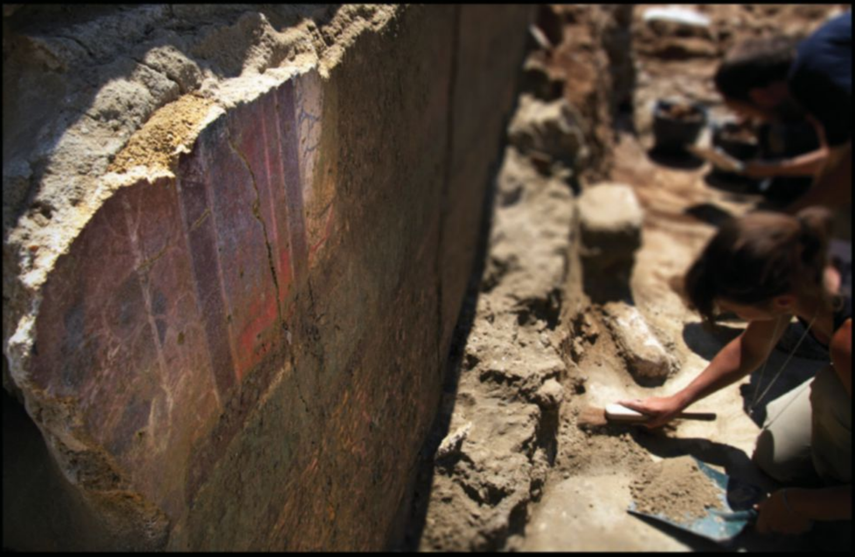
The Roman city of Arelate, today known as Arles, France, was one of the most important ports of the later Roman Empire. After siding with Julius Caesar during his civil war against Pompey, the town was formally established as a Roman colony for Caesar's veterans in 46 or 45 B.C. Strategically located along the Rhône River in southern Gaul, Arelate developed into such a major economic, political, and cultural center that it was referred to as the "little Rome of the Gauls" by the fourth-century poet Ausonius.

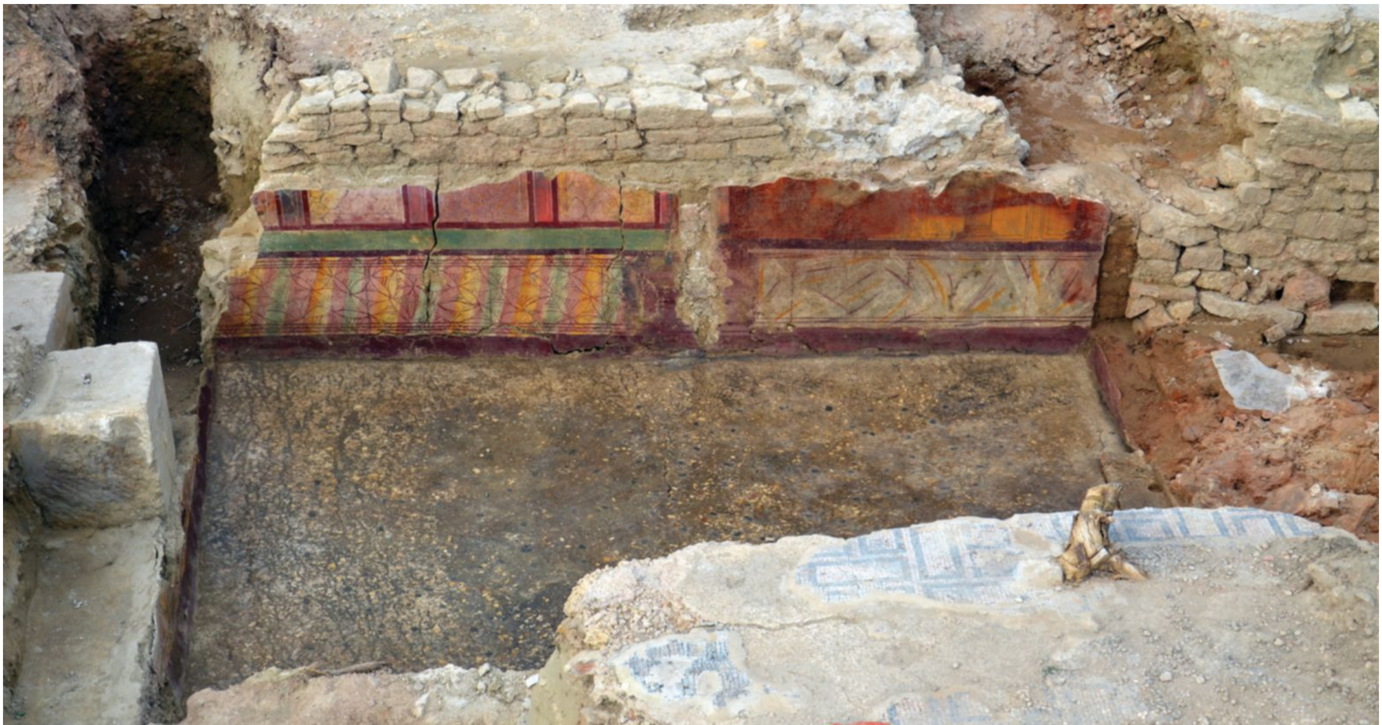
Today, the city's left bank, which served as the Roman settlement's civic and administrative heart, is strewn with the remnants of ancient monuments: a theater, an amphitheater, baths, and a circus. It has long been thought that the city's right bank was far less developed in the early Roman period, only witnessing significant growth decades or centuries later. However, this perception of ancient Arles is beginning to change as an ongoing investigation uncovers parts of a wealthy Roman residential area, providing new evidence of the early development of Arles' periphery and also revealing some of the finest Roman wall paintings found anywhere in France.

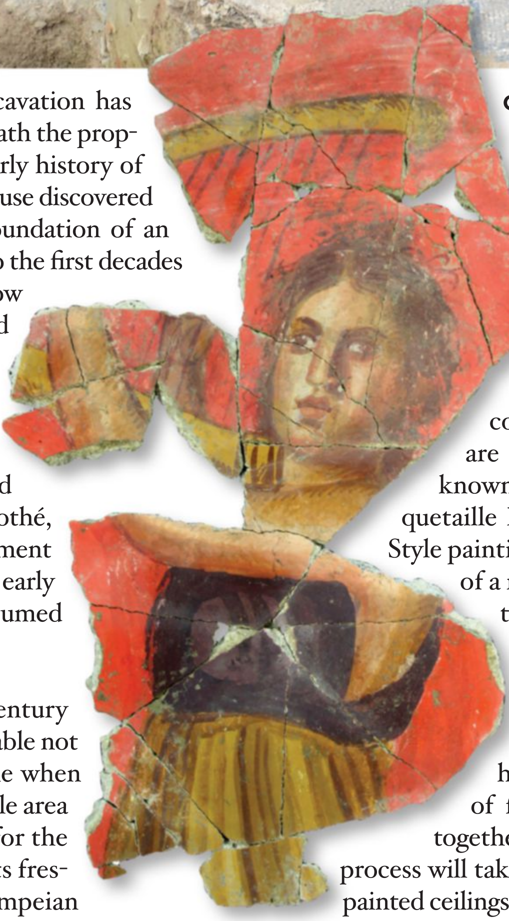
A project led by the Museum of Ancient Arles is in the middle of a multiyear campaign to excavate the site of an eighteenth-century glassworks factory in the Trinquetaille district along Arles' right bank. The glassworks complex—itself a designated historic site—was acquired by the city in the late 1970s. During the initial excavation of the property in the 1980s, archaeologists discovered a second-century A.D. Roman residential neighborhood buried beneath it, but the investigation was short-lived.

Over the past two years, a plan for rehabilitating and restoring the site has brought archaeologists back for the first time in decades. According to lead archaeologist

Archaeologists uncover another wall in the same house decorated in the so-called Second Pompeian Style, which frequently employed painted architectural elements to create the illusion of three-dimensional masonry.







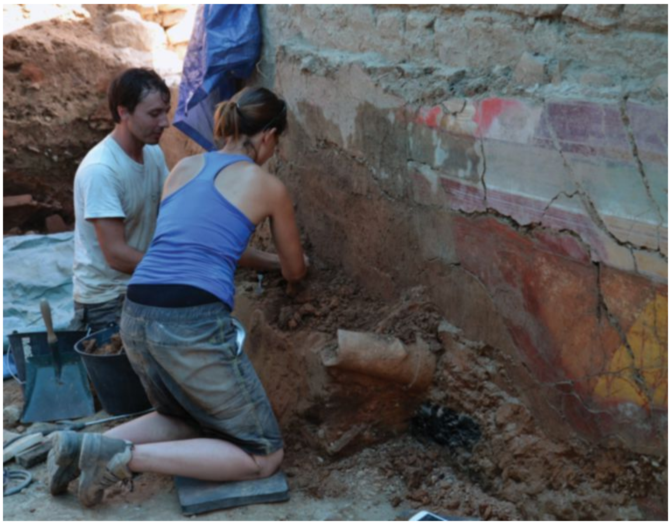
**One wall of a *cubiculum*, or bedroom (above), is painted with imitation columns and marble paneling, also in the Second Style. An adjoining room displays one-half to three-quarter life-size figures, one of which (left) has been identified as a woman playing a stringed instrument.**

Marie-Pierre Rothé, the renewed excavation has allowed researchers to dig deeper beneath the property and to unravel the surprisingly early history of the site. Beneath at least one Roman house discovered in the 1980s lies the much earlier foundation of an opulent Roman property dating back to the first decades of the Roman colony. Researchers know that as the new colony was incorporated into the Roman political and economic system, there was a sudden influx of wealth into the city, along with opportunities for advancement for both locals and Romans who migrated there. "One of our objectives," says Rothé, "is to better understand the development of the Roman city of Arles during this early period in a neighborhood that was assumed to have been deserted."

THE DISCOVERY OF this first-century B.C. *domus*, or home, is remarkable not only because it dates to a time when archaeologists believed the Trinquetaille area was void of such structures, but also for the quality of the house's wall paintings. Its frescoes were designed in the Second Pompeian Style, according to August Mau's nineteenth-century classification of the four major styles of Roman painting. The Second Style, which dates to between 70 and 20 B.C. in Roman Gaul, frequently used trompe l'oeil composition and painted architectural elements such as columns, windows, and marble panels to create the illusion of three-dimensional masonry. Although paintings such as these are common in Italy, especially Pompeii, they are rare in France, where only around 20 known examples exist. The excavations in Trinquetaille have uncovered the best in situ Second Style paintings in France, thanks to the preservation of a nearly five-foot-tall Roman wall to which the frescoes are still attached.

While some sections of the frescoes still remain in situ, most of the painted plaster must be retrieved from the debris and fill layers. Archaeologists now have hundreds of boxes containing thousands of fragments that need to be pieced back together like a giant jigsaw puzzle. Although this process will take years to complete, large portions of the painted ceilings and walls are already being reconstructed.

Thus far, two rooms of the first-century B.C. domus have been excavated. One is most commonly identified as a *cubiculum*, or bedroom. Its frescoes imitate architectural elements, such as marble paneling, Corinthian columns, podiums, and orthostats, all rendered in colors that are still vibrant. One half



**A preserved five-foot-tall section of wall, which was buried in the foundations of later buildings, provides the best in situ example of Second Style painting in France.**

of the room, where the bed was likely located, shows a more luxurious design of multicolored stripes and burgundy rosettes.

The adjacent room, which served as a reception area for important guests, is decorated with large-scale figures in the Second Style. According to French National Institute of Preventive Archaeological Research art historian Julien Boislève, this combination is previously unknown in Gaul. One-half to three-quarter life-size figures are painted upon a bright red background, a color that was particularly expensive. "These decorations with large-scale figures are extremely rare, even in Italy, with only a half-dozen examples known," says Boislève. "In houses like the Villa of the Mysteries in Pompeii or in the Villa of Publius Fannius Synistor in Boscoreale, they mark a high level of luxury."

For Rothé, the discovery of such a lavish late first-century B.C. house has a major impact on knowledge of the topography, urbanization, and early citizens of ancient Arles. The established notion that the right bank only developed much later is, for her, unsubstantiated. "This idea can now be swept aside since the archaeological material shows that this domus belongs to the late Republican period, and is likely to have been introduced during the creation of the colony by Caesar or even earlier," she says. "These excavations demonstrate that development of the right bank likely happened concurrently with that of the left bank, from the time of the foundation of the Roman colony."

Although at this stage it is not possible to identify all the painted characters, at least one female figure appears to be playing a harp-like stringed instrument. Other clues imply the presence of the god Pan, suggesting a Bacchic theme common to many Roman wall paintings. Only the most prominent families of the ancient city could have afforded a house displaying artwork of this high quality, likely created by artists brought from Italy. The house may have belonged to a wealthy Roman official who moved to Arelate in the years following its colonial founding, or perhaps it was owned by a local Arlesian aristocrat assimilating Roman culture by imitating the behavior of affluent Romans in Italy, who frequently outfitted their homes in this manner. "These paintings shed new light on the spread of Roman decorative styles after the conquest," says Boislève. "They are unique in Gaul." ■

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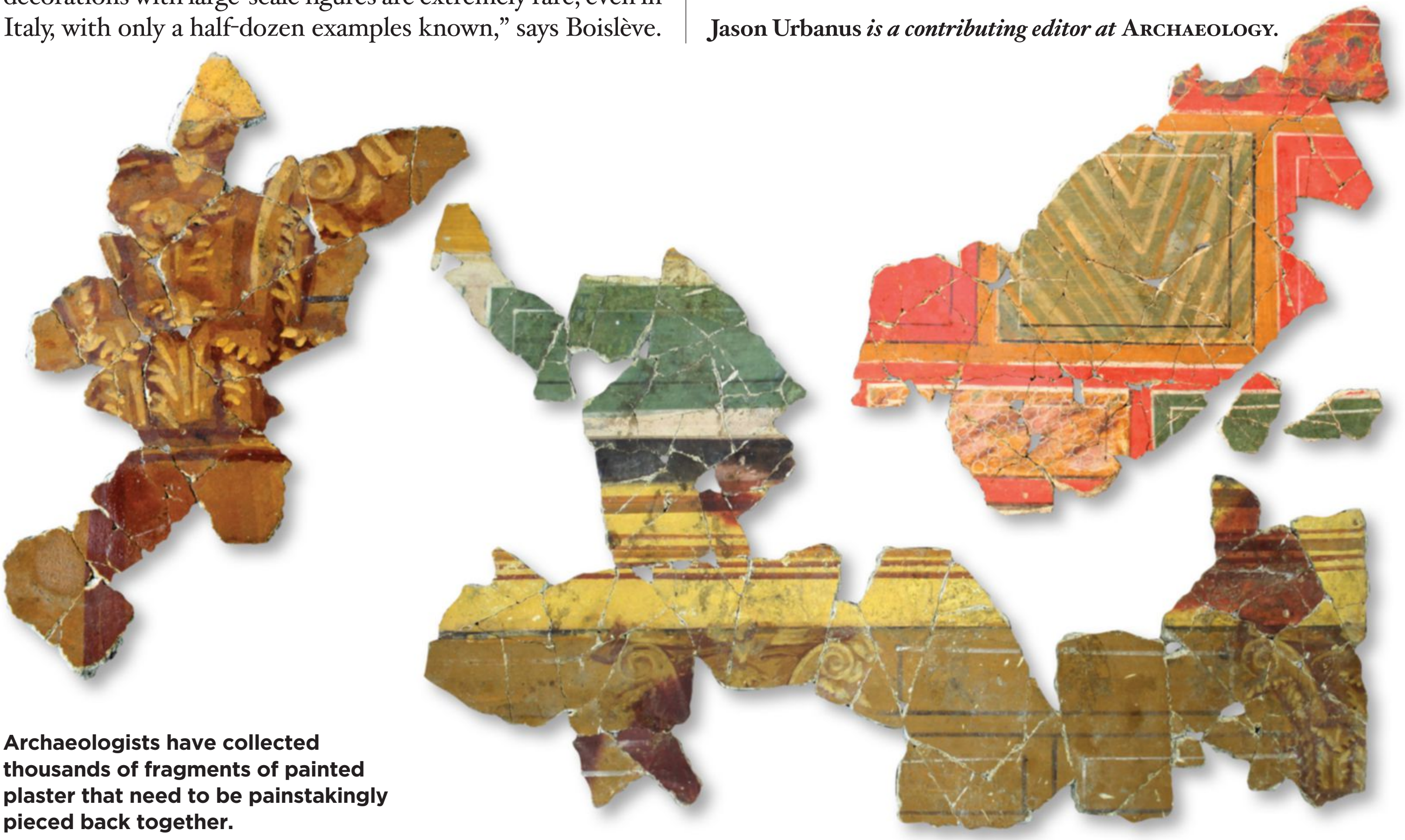
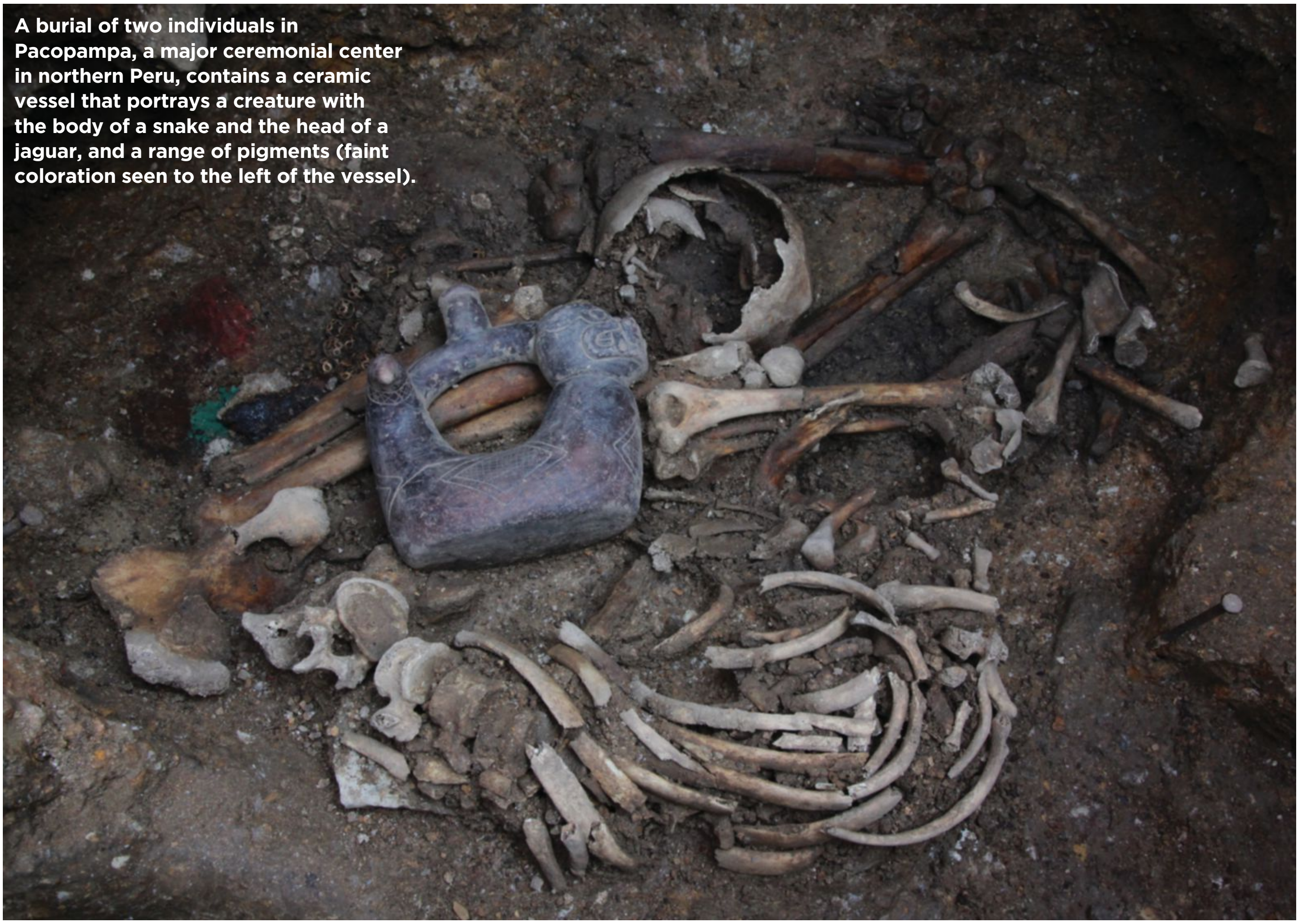
**Jason Urbanus** *is a contributing editor at* ARCHAEOLOGY.



**Archaeologists have collected thousands of fragments of painted plaster that need to be painstakingly pieced back together.**



**A burial of two individuals in Pacopampa, a major ceremonial center in northern Peru, contains a ceramic vessel that portrays a creature with the body of a snake and the head of a jaguar, and a range of pigments (faint coloration seen to the left of the vessel).**

# Colors of the Priesthood

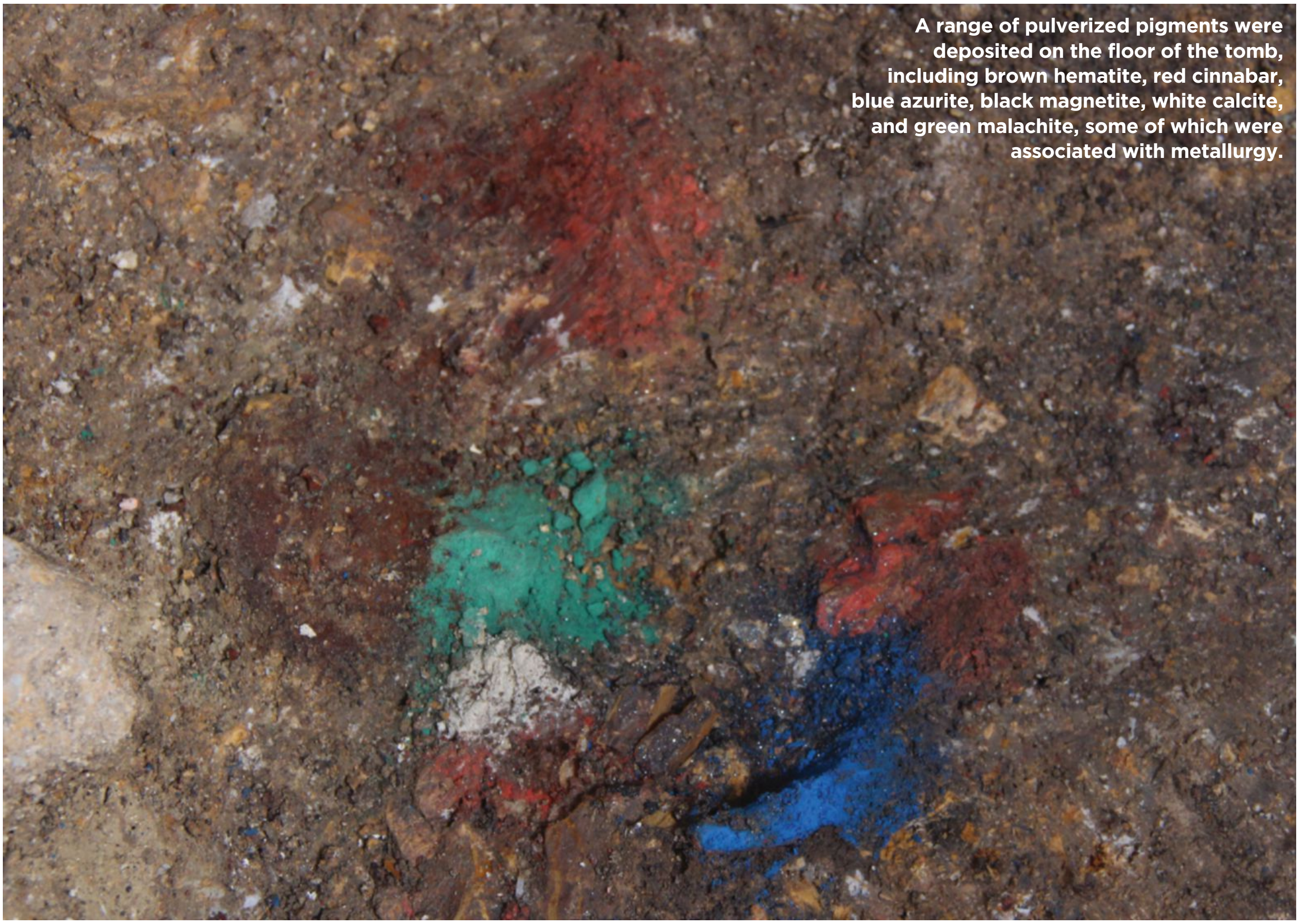
## An intriguing source of power is revealed in an ancient Andean tomb

*by* Daniel Weiss

Situated high in the northern reaches of the Peruvian Andes, Pacopampa was a major ceremonial center established around 1200 B.C. The temple complex there consisted of a series of ascending terraces, with the uppermost section believed to have been the most sacred and exclusive. It was at this level that a team of archaeologists from Japan's National Museum of Ethnology and Peru's San Marcos University recently uncovered a tomb containing the remains of two people who lived around 600 B.C. The goods buried with them show that they were important members of their society, says the team's leader, Yuji Seki of Japan's National Museum of Ethnology. Indeed, they may have been regarded as being powerful both in the earthly realm and beyond.

One of the individuals was buried with a ceramic vessel depicting a creature with the body of a snake and the head of a jaguar—animals believed to have supernatural abilities that could be transferred to priests. Snakes were seen as denizens of the underworld, while jaguars were thought to form a bridge between the earth and the sky. The other individual wore a necklace made of open gold spheres, with the metal worked into sinuous curves, possibly to symbolize the undulating motion of snakes. On the base of the tomb beside this individual's head were deposited, in pulverized form, a range of colorful minerals: red cinnabar, green malachite, dark-brown hematite, glossy black magnetite, white calcite, and blue azurite. Seki believes that the objects and minerals found in the tomb suggest that its inhabitants were connected not just to powerful animals, but also to metallurgical feats that would have appeared magical to their contemporaries.

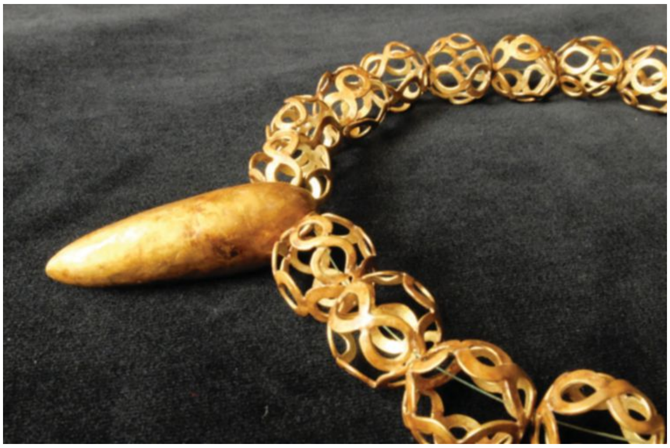
Some of the tomb's minerals are commonly found in elite Andean burials. Cinnabar, for example, a form of mercury, was



A range of pulverized pigments were deposited on the floor of the tomb, including brown hematite, red cinnabar, blue azurite, black magnetite, white calcite, and green malachite, some of which were associated with metallurgy.

frequently used in burials of high-ranking individuals, and may have been thought to protect the body against decomposition. While the origin of the cinnabar found in the burial is as yet unknown, isotopic testing of cinnabar discovered in another tomb found at Pacopampa in 2009 has revealed that it originated in a mine several hundred miles to the south in Peru's central highlands. "Some of these are not locally available minerals," says Richard Burger, an expert in early Andean civilization at Yale University who was involved in testing the cinnabar from the earlier tomb. "They were only being used by special individuals at special times." The pair buried at Pacopampa, however, enjoyed an even greater distinction. As far as Seki knows, the presence of all of these pigments together is unprecedented.

Seki believes that the discovery of other minerals in the tomb—specifically azurite and malachite—is highly significant. Both minerals are forms of copper carbonate that are thought to have been used to make copper items such as pins and needles—a transformation that would have been extremely impressive. "Making copper was a form of alchemy," says Seki. "The raw materials, azurite and malachite, have a completely different appearance from the finished product." It would, therefore, be difficult to imagine that they could be used to make copper. By contrast, Seki notes, gold items found at Pacopampa were made using gold dust collected from rivers, a far more comprehensible process. Seki believes that the two individuals buried in this newly uncovered tomb may very well have controlled the production or distribution of metal objects. It is this association with copper-making, he believes, that helped establish the two as leaders with magical powers and merited them an extraordinary burial. ■



The open beads of this gold necklace, worn by one of the individuals in the tomb, bear a figure-eight design that may symbolize the undulating motion of snakes.

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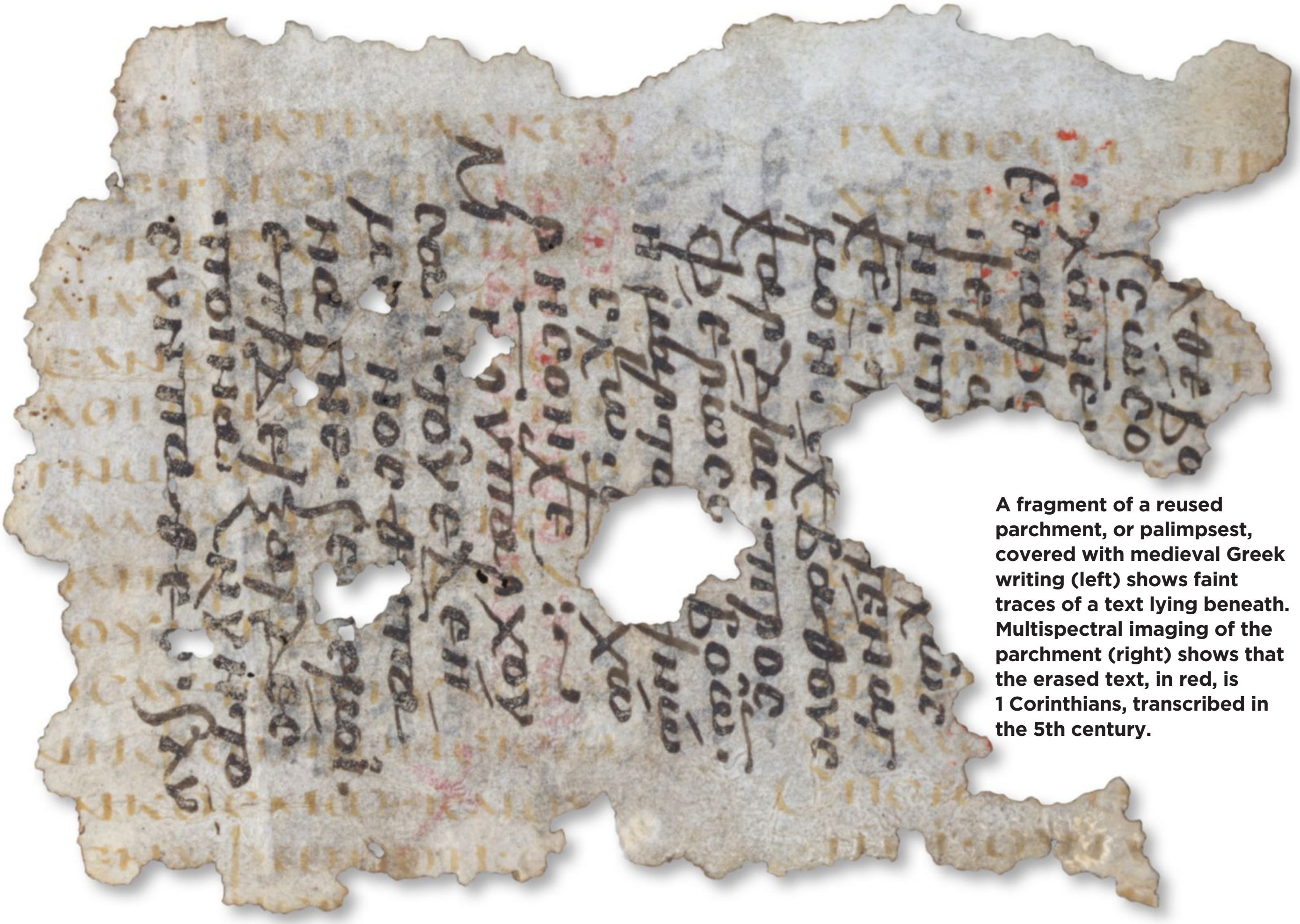
**Daniel Weiss** *is a senior editor at* ARCHAEOLOGY.

# Recovering Hidden Texts

## At the world's oldest monastery, new technology is making long-lost manuscripts available to anyone with an Internet connection

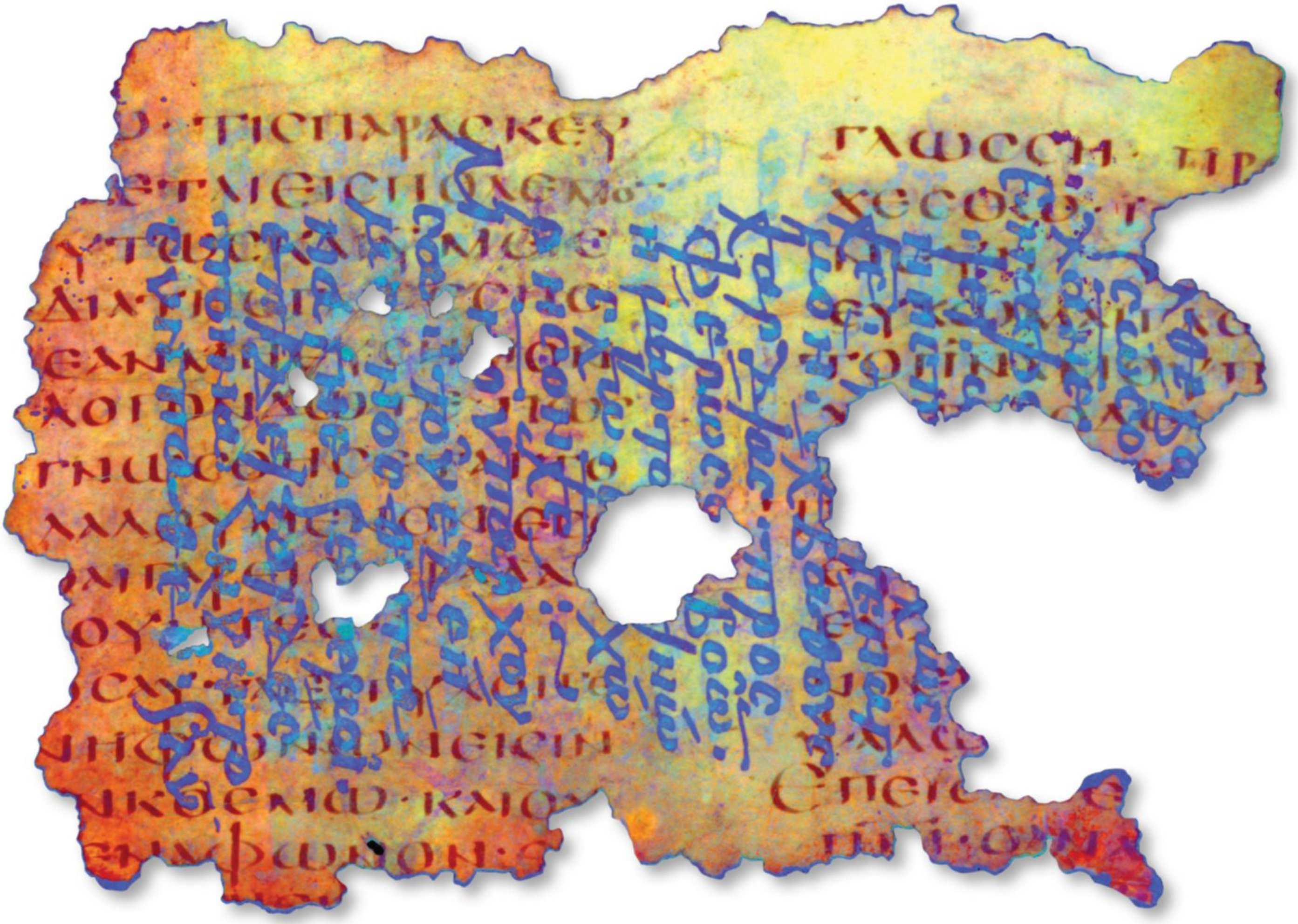
*by* Eric A. Powell



**A fragment of a reused parchment, or palimpsest, covered with medieval Greek writing (left) shows faint traces of a text lying beneath. Multispectral imaging of the parchment (right) shows that the erased text, in red, is 1 Corinthians, transcribed in the 5th century.**

Sometime in the eighth century, a monk at St. Catherine's Monastery in Egypt's Sinai Peninsula was preparing to transcribe a book of the Bible in Arabic and needed fresh parchment. New parchment was an expensive commodity at the time and was difficult to obtain, especially for a humble monk copyist living in a remote desert monastery. Luckily for him, the venerable religious community had a massive library that included books that were no longer in use. These manuscripts, some written in extinct languages, or thought to be unimportant, were valued only for their potential as sources of recycled parchment. No one in the monastery would have thought twice, for instance, when, while searching for writing material, the monk plucked out of the collection an ancient Greek text that had gone unread for a generation or more. None of his brothers would have batted an eye as he used a knife to carefully scrape away the centuries-old ink. Soon, the words were gone and the parchment was ready for

**St. Catherine's Monastery was built at the foot of Mt. Sinai in the 6th century on the orders of the Byzantine emperor Justinian. Over time it became an important destination for Christian pilgrims. Monks have lived within its walls ever since, and still welcome travelers.**

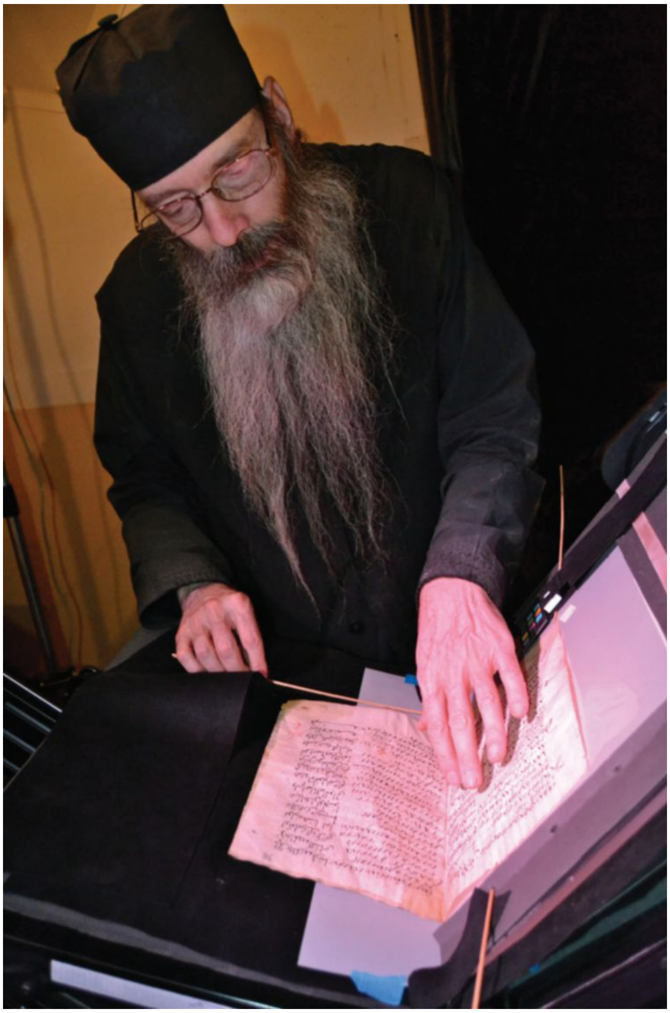


the monk's fresh transcription of Bible verses. Today, erasing an ancient text seems an incalculable loss, but to the eighth-century scribe, it was an act of devotion and even a measure of progress—an obsolete text was gone, and a holy manuscript that would enrich countless spiritual lives was left in its place.

The original words on this reused text, or palimpsest, have been lost for over a thousand years. But now with the help of modern multispectral imaging technology, a team of scientists and scholars is able to peer through the manuscript's visible ink and read the long-vanished text below. The library at St. Catherine's contains well over a hundred such palimpsests, each one offering vivid new glimpses of the early Christian era. Later this year, after a large number of the palimpsests have been studied and translated by specialists, the monastery will make them available online, meaning that texts that have gone unread for a millennia can be pored over by scholars and interested laypeople from all over the world. "These are cultural treasures that are important to our common history," says Michael Phelps, executive director of the Early Manuscripts Electronic Library, which works with the UCLA Library to coordinate the project. "We're helping recover lost communities that made important spiritual and literary contributions, and allowing their voices to speak again."

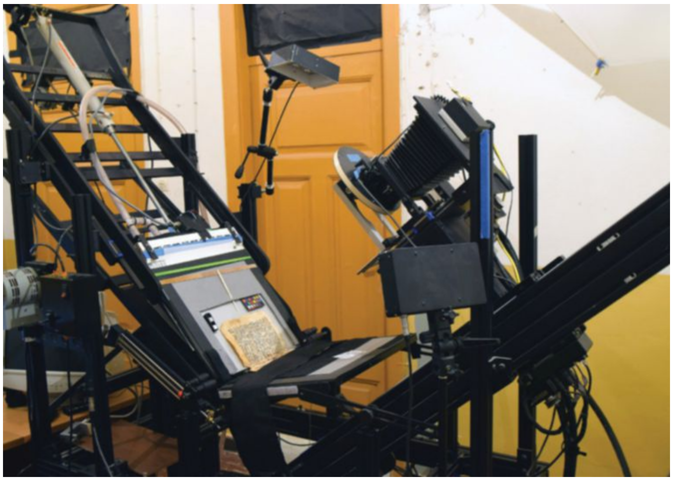
TUCKED INTO A VALLEY at the foot of Mt. Sinai, the fortified monastery of St. Catherine's was built in the sixth century on the orders of the Byzantine emperor

Justinian. Known officially as the Imperial Monastery of the God-Trodden Mount Sinai, St. Catherine's is located on an especially holy site, where God was thought to have spoken to Moses through the burning bush. Archaeologist Peter Grossman of the German Archaeological Institute Cairo has conducted a survey of the site, and notes that thanks to its six-foot-thick granite walls that rise some 30 feet, the monastery was never destroyed, and so retains architecture from all phases of its development (including a small chapel that was converted into a mosque in the tenth century and is still used for special occasions). "St. Catherine's is better preserved than other monasteries," says Grossman. "Even the iron fittings of the doors in its walls and the original wooden gate of the main entrance are still in situ." Over the centuries, the monastery attracted a steady stream of pilgrims who came to visit the holy sites around Mt. Sinai. They were welcomed and sheltered by a small community of monks who led lives of contemplation and prayer in the midst of the biblical landscape of the Sinai wilderness. Today, St. Catherine's is the world's oldest continually occupied monastery, and is home to around 25 Greek Orthodox monks, who observe rites that have continued uninterrupted within its walls for 15 centuries.



**St. Catherine's librarian Father Justin gingerly turns the page of a palimpsest undergoing multispectral imaging.**

The monastery has a rich collection of icons and other religious objects, but it is most famous for its library, which, with more than 3,300 manuscripts, is second only to that of the Vatican in terms of the number of ancient texts it contains. While the Vatican library was assembled carefully over the centuries, St. Catherine's collection is different, more eclectic. "The Sinai library differs from most libraries in that it grew organically to provide the monks with copies of the scriptures and books that would inspire and guide them in their dedication," says Father Justin, who serves as the monastery's librarian. Many of the monks and pilgrims who came to the monastery over the centuries left manuscripts as gifts, resulting in an especially idiosyncratic collection. In addition to important Christian texts, the library contains, for instance, one of the world's earliest known copies of the *Iliad*.



**The Sinai Palimpsest Project's spectral imaging system is equipped with a high-resolution camera and a custom cradle that holds manuscripts as they are subjected to four separate imaging techniques.**

Father Justin began a program of digitizing the monastery's collection in the late 1990s. He knew, however, that he was unable to make a record of some of the most intriguing texts in the collection. Since the late nineteenth century, scholars had been aware that many of the works in the collection are palimpsests that conceal older texts (see "The Bible Hunters," page 43). Over the years, scholars were able to read three of the palimpsests that were legible, but the vast majority remained invisible to the naked eye and went unstudied. In 1996, a Georgian scholar used ultraviolet light to read a Sinai palimpsest with an overtext in medieval Georgian. He found that the underlying text was written in Caucasian Albanian, and was the first example of a text written in this now-extinct language. It was an exciting discovery, but the process had drawbacks. "Prolonged use of ultraviolet light is a risk to both the eyesight of the scholar and the manuscript itself," says Father Justin. The technique just wasn't a practical way to read the library's palimpsests.

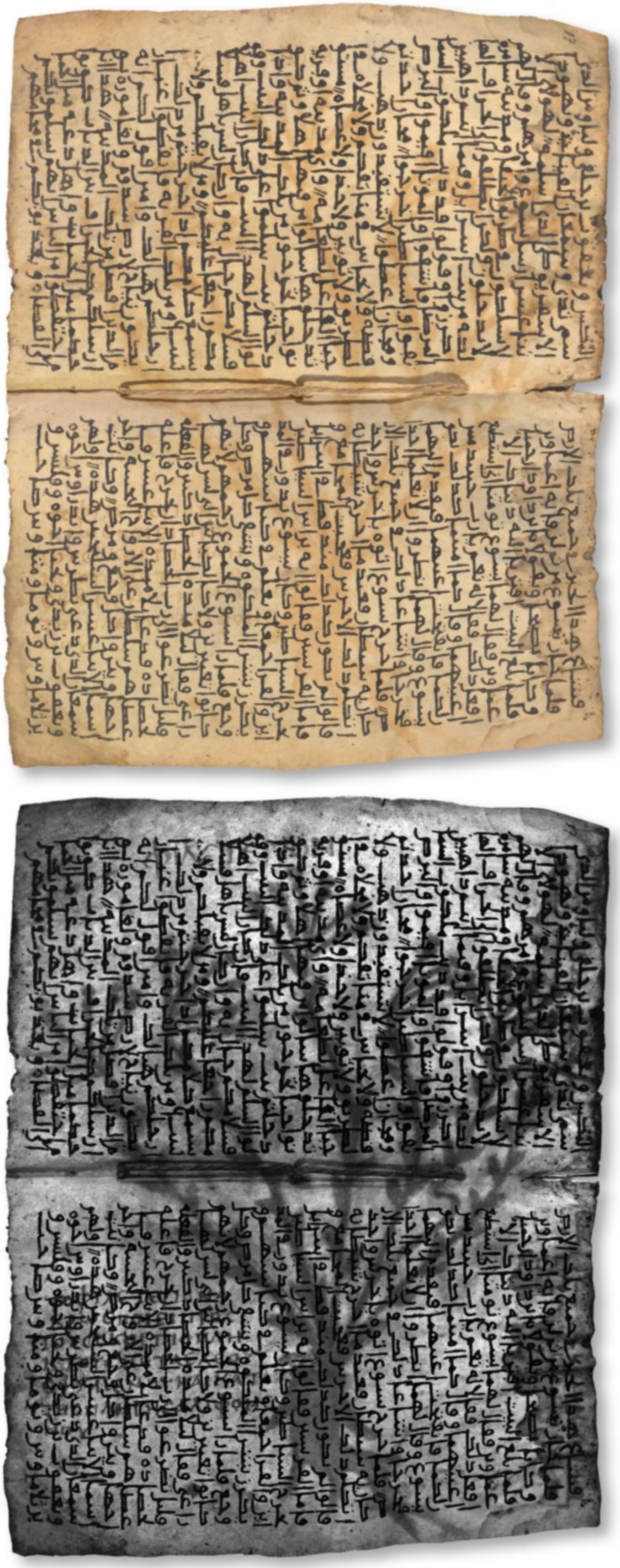
Father Justin learned of an ambitious scientific and scholarly effort under way from 1998 to 2008 to use multispectral imaging technologies to read the Archimedes Palimpsest, a tenth-century copy of the great Greek philosopher's writings that had been overwritten by thirteenth-century Christian monks. He contacted the team decoding the Archimedes Palimpsest, and soon many of the scientists involved in the project agreed to again pool their resources to read the Sinai palimpsests. Organization of the project fell to Phelps and the Early Manuscripts Electronic Library, which uses digital technology to make ancient manuscripts available online to both scholars and the general public.

In 2011, the Sinai Palimpsest Project began imaging some of the 130 manuscripts in St. Catherine's library that had been identified as palimpsests. Over the course of five years, the team visited the monastery 17 times. Before each session, University of Vienna medievalist Claudia Rapp, the project's scholarly director, would consult with Father Justin, and together they would select important palimpsests suitable for multispectral imaging. The team would then subject each page to four state-of-the-art technologies. One method developed specifically for the project involves backlighting each page with multiple wavelengths that reveal where the ink of the undertext had eroded the parchment.

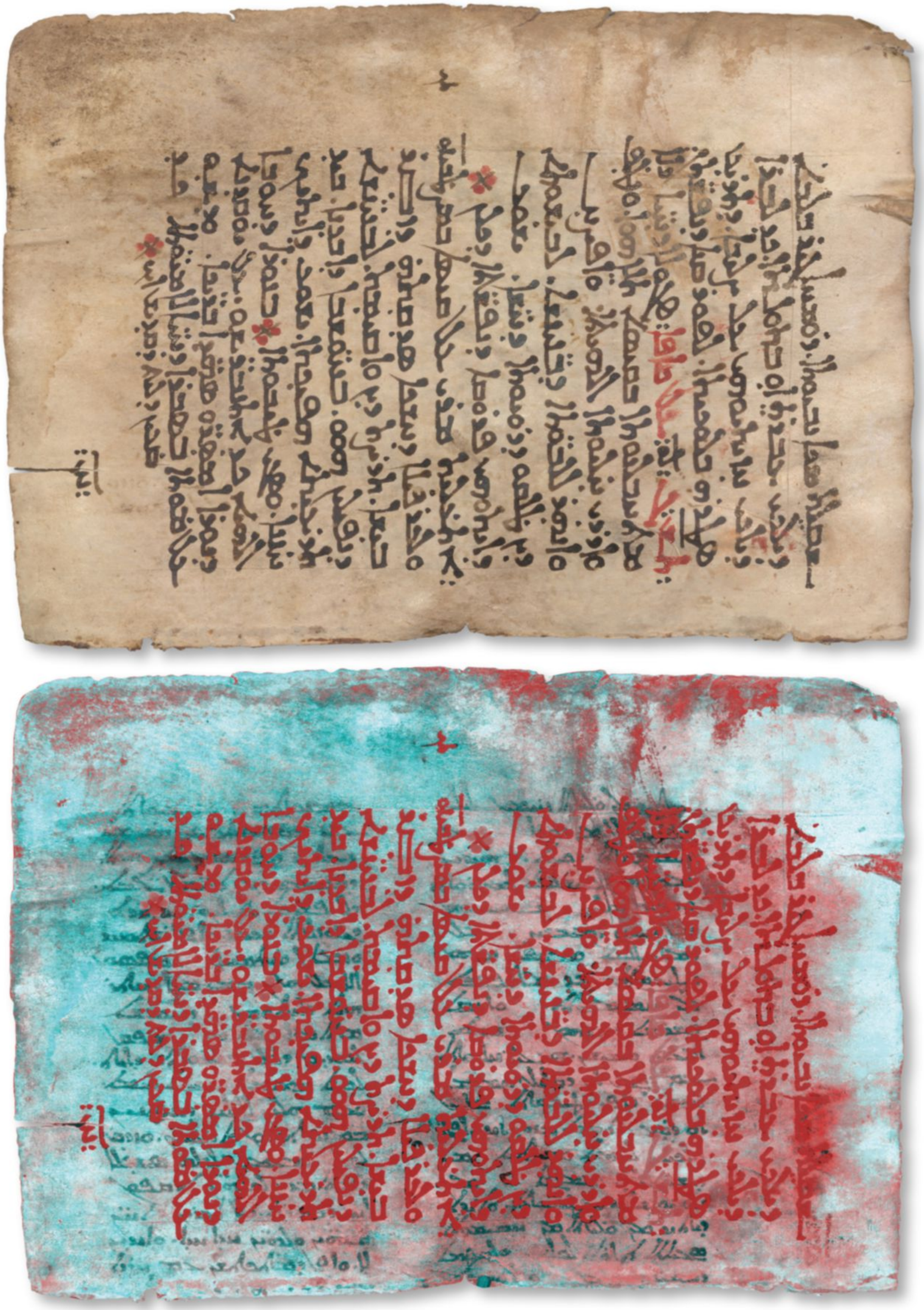
These images, once processed and viewed in combination, render long-lost words legible. The Sinai Palimpsest Project has now imaged some 6,900 pages, collecting an unprecedented amount of data on these formerly illegible or invisible manuscripts. "I call this process the archaeology of the page," says Rapp. "Except as we dig we don't destroy the layers that lie above, and we're still able to make things visible that have been hidden for centuries."

The effort is already giving the team new insight into the role St. Catherine's played in the medieval world. While it is one of the world's most famous Christian sites, scholars have an incomplete picture of it during this period. "The history of St. Catherine's from the seventh to the eleventh centuries is little known," says Rapp. "The palimpsests dating to this period give us a new picture of the role the monastery played in the Christian world." The diversity of languages found in the palimpsests, a total of 10, show that pilgrims came to St. Catherine's from all over the Middle East and Europe. In addition to more text in Caucasian Albanian, the team has discovered palimpsests in Ethiopic, Slavonic, Armenian, and, importantly, in Latin, some written in a style that was popular in Anglo-Saxon monasteries. "We were surprised by the number of Latin texts," says Rapp. St. Catherine's is an Orthodox monastery and was previously not thought to have had strong links to the Latin-speaking Catholic Christian world. But the palimpsests show that a number of pilgrims from Western Europe, perhaps from as far away as Britain, made the trek to the monastery and left behind manuscripts that were then recycled.

For Rapp, another significant discovery the project has made is that a number of palimpsests were written in a dialect of Aramaic known as Christian Palestinian Aramaic. This language vanished in the thirteenth century, and is poorly understood, largely because so few texts are known, making the discovery of these palimpsests especially exciting for scholars. "We have



**Before multispectral imaging, writing on a medieval Arabic manuscript (top) concealed a full-page illustration of a medicinal herb (above) dating to the 5th century.**



A medieval document (top) in Syriac, a dialect of Aramaic, was written on top of a 9th-century Syriac translation (above, in black) of an ancient Greek medical text.

increased the number of known Christian Palestinian Aramaic texts by 30 percent," says Rapp. "I have a colleague preparing a grammar of the language, and she's very grateful she didn't publish it before we found these palimpsests."

The content of the palimpsests also offers a look at the diversity of manuscripts that were available to monks in the early medieval period. Some of the palimpsests contain biblical texts such as fifth- and sixth-century versions of Corinthians and the book of Numbers, but they also hold a number of secular works that monks could have consulted. The team has identified a variety of medical writings, including a treatise on medicinal plants, which contains a treatment for scorpion stings, the earliest surviving texts of Hippocratic medical works, and a previously unknown version of a list of medical terms.

Those works hint at how the monks may have understood and treated illnesses, a very practical dimension of their lives, but the team has also found evidence that at least some monks could have relied on the library for pleasure reading. They have identified a palimpsest containing the illustrated version of a secular fictional work, the oldest known non-biblical illustrated manuscript, perhaps suggesting that monks may have not confined themselves to religious reading.

Soon one of the palimpsests may even allow the team an intimate glimpse of the monks' spiritual lives. In it they have discovered musical notations, likely for a liturgical chant, which are still being studied. Once they are deciphered, the team may be able to recapture the sounds of one of the ancient chants that were such an integral part of religious services at the monastery.

TWENTY-THREE SCHOLARS are currently at work translating the palimpsests, but enough have been studied that it is now clear that St. Catherine's library is the world's richest source of Christian palimpsests. And the project has helped Father Justin and the monks of St. Catherine's not just to recover lost history, but also to celebrate their faith. "The manuscripts are an inspiration to the monks who live here today," says Father Justin, who finds the discovery of the Latin texts, in particular, very significant. "They show that there was travel and communication between East and West, at a time when scholars have presumed great isolation. This is an important example for our own times."

Thus far the team has imaged 75 of the manuscripts previously identified as palimpsests. In the process, Rapp has newly identified at least 30 more palimpsests in the collection. She believes that still more of the books in St. Catherine's library may have been written on reused parchment. There could be hundreds more palimpsests yet to be discovered, an invisible library that may hold as-yet-unknown biblical texts, or more manuscripts that illuminate medieval monastic life in this remote outpost of Christianity. ■

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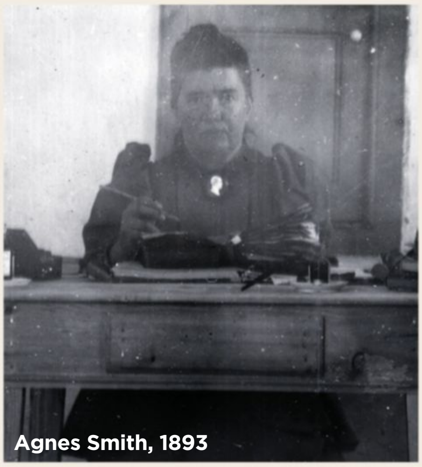
**Eric A. Powell** *is online editor at* ARCHAEOLOGY.
*To learn more about the Sinai Palimpsest Project, go to sinaipalimpsests.org*

# The Bible Hunters

THE STUDY OF palimpsests in St. Catherine's library actually began in 1892 when an unlikely pair of trailblazing, self-taught biblical scholars arrived on camelback. At 49 years of age, twin Scottish sisters Agnes and Margaret Smith had made the arduous pilgrimage to St. Catherine's Monastery in hopes of finding ancient versions of the Bible. They were aware that in 1844, German scholar Constantin von Tischendorf discovered a biblical manuscript in St. Catherine's library dating to 325. The sisters knew that the text, called the Codex Sinaiticus, was the oldest known version of the New Testament. It had been central to reconciling differing versions of the Bible and had led to the creation of an authoritative Greek edition of the New Testament.

The Smith twins, both widows, were passionate about studying the oldest biblical texts. To that end, they had dedicated themselves to learning 12 different languages, including both modern and ancient Greek, medieval Arabic, and Syriac, a dialect of Aramaic, a Semitic language that was once spoken and widely used as a literary language across the Middle East. The pair arrived at the monastery as some of the most learned visitors the monks had had in decades.

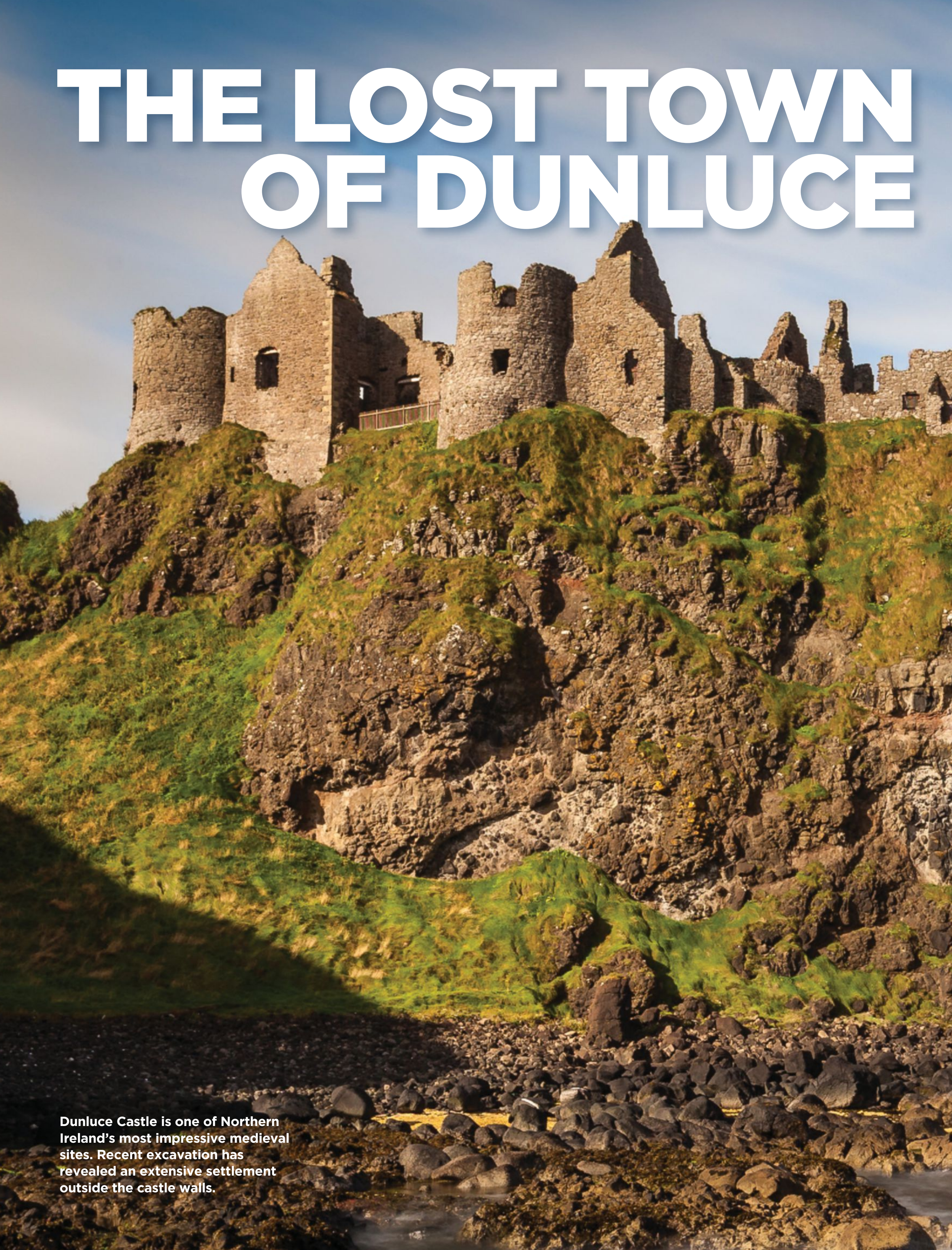
The St. Catherine's community was generally wary of outside scholars, not least because Tischendorf never made good on his promise to return the Codex Sinaiticus to the monastery. But unlike previous visitors, both women were fluent in colloquial modern Greek and so could speak with the Orthodox monks in their own language. Soon they were on friendly terms with the monastery's librarian, and were allowed to investigate the collection, where the pair catalogued and photographed manuscripts and searched for previously unknown early versions of biblical texts. There, in an unused cabinet, Agnes found an Arabic manuscript describing the martyrdom of female saints. Though the text was not unusual, except perhaps for the somewhat racy language it used to describe the suffering of the saints, Agnes soon knew the manuscript was special. Under the Arabic text she could make out older writing in Syriac. She understood it was a palimpsest and with her command of Syriac, she knew the undertext was probably the Gospel of Mark.


Agnes Smith, 1893

The following year, the sisters returned to the monastery in the company of three other scholars to transcribe the manuscript. This time they were armed with a chemical reagent that could dissolve the overtext's ink and render the undertext visible. After demonstrating the technique for the monastery librarian, Agnes was allowed to apply the reagent to some leaves of the manuscript on the condition that she preserve a few lines of overtext on each page. As much as one-sixth of the undertext was rendered visible by this method.

After several weeks spent transcribing the manuscript, the scholars found it was a complete Syriac version of the Gospels of Matthew, Mark, Luke, and John. Dating to the third century, it was the oldest such account in Syriac ever discovered. Agnes edited a scholarly edition of the palimpsest Gospels, now known as the Syriac Sinaiticus, and its publication brought the sisters worldwide celebrity. Biblical scholars welcomed the discovery, and were able to use the Syriac text to resolve discrepancies that existed between different Greek versions of the Gospels. According to University of Cambridge theologian Janet Soskice, author of *The Sisters of the Sinai*, a biography of the sisters, the twins made an enduring contribution to biblical scholarship. "Having the Syriac version of the Gospels was a major boost to understanding the history of the Bible," she says. "Even today, scholars are very grateful to Agnes and Margaret."

# THE LOST TOWN OF DUNLUCE



**Dunluce Castle is one of Northern Ireland's most impressive medieval sites. Recent excavation has revealed an extensive settlement outside the castle walls.**

## Just outside an iconic Irish castle, archaeologists uncover the remains of a completely undisturbed historic town

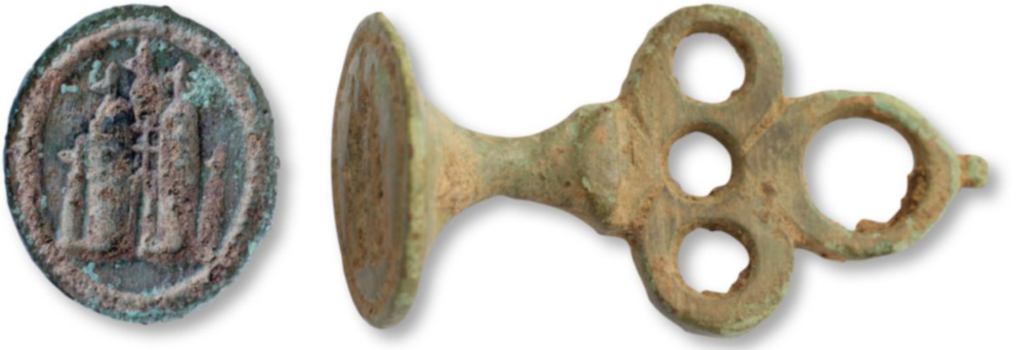
*by* Erin Mullally

Dunluce Castle never fails to impress as it comes into view for drivers along the northern Antrim Coast Road. The ruined medieval building perches in dramatic isolation on a basalt outcrop that extends into the chilly North Atlantic, and 100-foot cliffs drop steeply all the way around the castle. It is reachable only via a footbridge over a 20-foot-wide chasm and is one of the most iconic—and supremely defensible—locations in Northern Ireland. It is easy to see why its builders were drawn to the site in the fourteenth century, a period rife with intrigue, violence, and rebellion. Any potential attackers would have had a difficult time indeed reaching the castle.

While the castle today appears remote and secluded in the coastal countryside, new discoveries are indicating this wasn't always the case. Recently archaeologists have begun to explore the area outside the castle walls, where documentary sources record the existence of a seventeenth-century town. They've found evidence of a thriving settlement, as well as signs that the sprawl next to the castle began much earlier than anyone had thought. The finds are giving archaeologists a rare window into the daily life of an active late medieval settlement—one that was at the center of religious and nationalist conflicts that still resonate today.

In many historical narratives, the lives of the everyday people who came to inhabit the town of Dunluce have been overshadowed by the tales of those with wealth and influence—the inhabitants of the castle itself. Early documentary sources suggest that although a rural manor existed at Dunluce in the thirteenth century, it wasn't until several centuries later that it began to rise to prominence. The MacQuillans, a local Irish family, acquired the site around 1500 and began to build the castle towers and wall fortifications.

The new construction attracted the unwanted attention of the MacDonnells, a powerful Scottish clan active in the area, who captured the castle in the 1550s. The MacDonnells made the castle their family seat, from which they controlled territory along the north Antrim coast, known at the time as the "Route." Their activi-

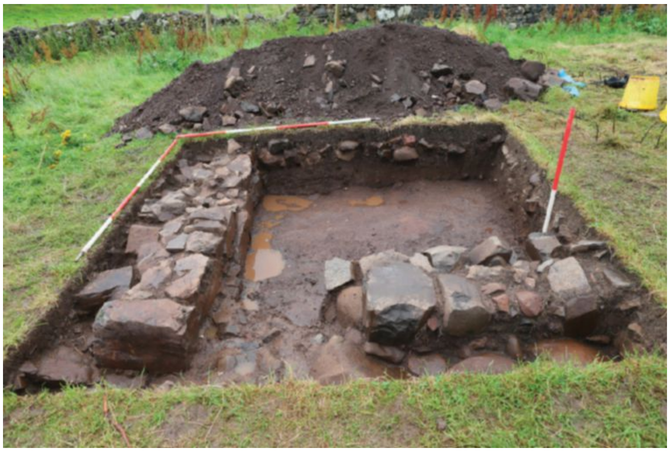


**A seventeenth-century seal, used to authenticate or close documents, was found in the newly excavated town, and may have belonged to a Scottish merchant.**

ties in turn attracted the attention of the English. In 1584, Queen Elizabeth, seeing a threat in the growing Scottish presence on Irish soil, ordered soldiers from Dublin to capture Dunluce. Just before the English took the castle after a three-day siege, "Sorley Boy" MacDonnell, chief of the clan, escaped. Sorley Boy was able to return to Dunluce Castle after a yearlong English occupation, and though he once again proclaimed it the home of the MacDonnells, he swore allegiance to Queen Elizabeth to avoid further bloodshed.

Sorley Boy's son, Randal MacDonnell, eventually inherited Dunluce and brought it into its golden age. He ordered the construction of a manor house within the castle, which he outfitted lavishly with tapestries, curtains, elaborate furniture, inlaid cabinets, and a full library. He further strengthened his ties with the English by attending the royal court in London. This strategic relationship was part of the process that would develop the settlement around the castle, and impact Irish history for centuries.

The MacDonnells maintained strong connections to Scotland and actively encouraged Scottish tenant farmers to relocate. Thus the town of Dunluce, just outside the gates of the castle, was established in 1608. Scottish merchants settled in and it soon became a trading hub. By inviting their fellow Scots to move to Dunluce, the MacDonnells became noteworthy early proponents of "plantation activity"—the organized colonization of Ireland by England and Scotland. The Irish native to the area, some of whom were displaced by these newcomers, were now forced to adapt to shifting political and economic circumstances. The establishment the Plantation of Ulster, which roughly spanned today's Northern Ireland, had major ramifications for Irish history. Though the MacDonnells were Catholics, like most of Ireland's population, most new settlers were Protestants. Divisions between the denominations would lead, eventually, to the partition of Ireland and the "Troubles" of the twentieth century, which claimed more than 3,000 lives.



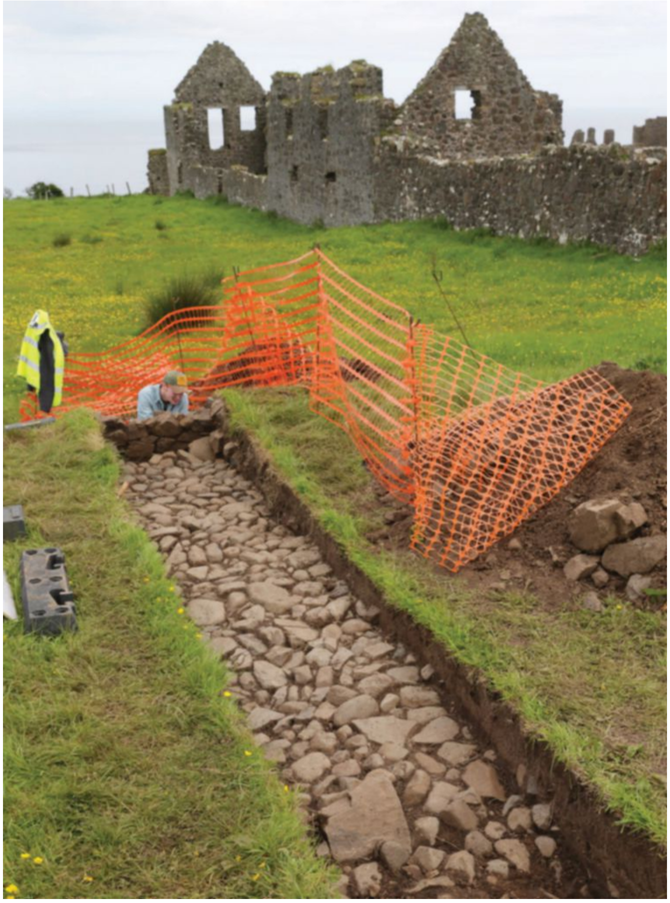
**The unusual corner doorway of a house suggests that the town of Dunluce is substantially older than once thought, and could date to the same time as the construction of the castle.**

Dunluce's golden age was short-lived. By the early 1630s, the town's lack of a natural harbor meant that other nearby localities (such as Coleraine, located directly on the River Bann) began to pull ahead economically. Bad harvests also proved harmful. In 1639, according to legend, part of the castle, including the kitchen, collapsed and fell into the sea, killing seven cooks but sparing a lucky cobbler who happened to be standing in the one intact corner.

Dunluce was once again swept into history with the eruption of the Irish Rebellion of 1641, when Catholic landowners, displaced by English Protestant rule, led an island-wide revolt. An Irish rebel force attacked Dunluce and burned the town to the ground. Historical accounts suggest that the victors loaded Scottish peasants into boats bound for Scotland. Following the rebellion, the MacDonnells reoccupied the castle, but Dunluce never recovered from these setbacks. It was mostly abandoned by the early 1680s. The castle began its slow decay into romantic ruins, and grass grew over the town. The castle has remained in the MacDonnell family—today it is managed under a deed of guardianship by Northern Ireland's Department of the Environment (DOENI)—but it was never revived, even though its defenses still stand. In 1928, the government of Northern Ireland began efforts to conserve and stabilize the site as Dunluce Castle blossomed into a tourist attraction.

"You have to remember that Dunluce has no natural harbor. It lacked the advantages of other nearby towns with harbors, where it was much easier to import and export any goods," says Andrew Gault, project archaeologist for Dunluce with DOENI. "Though Dunluce town managed to have a successful short run, commercially it would have been very difficult to make it over the long term." However, the remoteness of the castle and the lack of development or even agriculture in the area immediately around it is allowing Dunluce to begin another life—as a completely undisturbed early seventeenth-century town, a boon to archaeologists. For the first time, the lives of the common people are in the spotlight.

MAJOR ARCHAEOLOGICAL WORK at Dunluce started in 2008, when a team of archaeologists from Ulster University, Queen's University Belfast, and DOENI



**Cobblestone roadways from the seventeenth-century town have been found, and a new major excavation project is expected to reveal much more of the medieval settlement.**

began the first dedicated investigations of the town. "These early excavation studies showed us that the remains of Dunluce were preserved in exceptional condition, just inches beneath the ground," says Gault. "We believed that we could be looking at a site similar, both in scope and age, to Jamestown in Virginia." Over several of the following summers, archaeologists undertook additional painstaking surveys, dug evaluation trenches, and conducted basic excavation work as the outlines of roadways and buildings were revealed. As excitement built around what archaeologists were finding at the site, DOENI purchased the town fields from the MacDonnell family in early 2012.

As excavation continued, the shape of a well-planned settlement began to emerge more concretely. The excavators found cobblestone streets, footprints of stone and wooden houses, and garden terraces. Artifacts uncovered in several excavated buildings included seventeenth-century coins from continental Europe, wine glasses and bottles, horseshoes, buckles, and pieces from seventeenth-century board games. A harp-tuning peg indicates that traveling musicians may have paid frequent visits. There were more unusual finds as well, such as a silver Queen Mary coin, most likely minted during the 1550s, and a seventeenth-century seal, probably used by one of the Scottish merchants working in the town. According to Gault, "These artifacts seem to indicate stronger trade links with Scotland than we would have imagined previously, even given the plantation activity by the MacDonnells. Other objects from other points in Europe give us an indication that Dunluce was a well-frequented trading hub of its time."

At its peak, Dunluce town likely had between 300 and 400 residents, who would have been considered well-off at the time. "It's easy to view Dunluce Castle as quite a remote and isolated site today, but now we can see that it was a thriving commercial center 400 years ago," continues Gault. "We can now witness the average everyday life of the people who lived in Dunluce, rather than that of just the elite within society who inhabited the castle grounds."

But the research revealed more than just Dunluce's golden-age town. Archaeologists were recently excavating a stone structure just east of the castle, which they had assumed to be another part of the seventeenth-century settlement. Further inspection showed that the structure had a doorway at its corner, unlike any other building there, prompting a closer look.

A radiocarbon sample taken from a fireplace on the clay floor of this structure points to a construction date in the late fifteenth century, roughly the time when the first castle fortifications were being built. Pottery samples from the same period were also found, strongly suggesting that there was an extensive area of settlement around the structure centuries earlier than was previously thought.

"What we are now beginning to uncover are traces of earlier and extensive late medieval settlement activity, which are equally as important as the remains of the seventeenth-century Dunluce town," says Mark Durkan, environment minister for Northern Ireland. "Very few fifteenth-century buildings, other than those built entirely from stone, have survived in Ulster, and normally there would be few traces, if any, for archaeologists to investigate. We are extremely lucky." As less than 10 percent of the town site has been excavated to date, both fifteenth- and seventeenth-century discoveries offer indications that many more exciting finds are yet in store. It amounts to nothing less than a front row seat to the ups and downs of Dunluce's history and the story of how its village, castle, and fortifications were developed by both the MacQuillans and the MacDonnells over the centuries.

The initial archaeological project at Dunluce has been completed, but DOENI is currently planning another major five-year excavation and conservation plan. Members of the public have been actively involved in the excavations themselves, which have included volunteer opportunities.

Plans are also under way to make Dunluce town more accessible to visitors. People will eventually be able to walk the original cobblestone streets and observe the everyday life of its residents, as well as learn firsthand about the unique history of the site. "The rediscovery of the town has created new interest not only in Dunluce, but also in our shared Northern Ireland heritage," says Gault. "Dunluce is such a picturesque location that sometimes it's easy to forget the sheer amount of history that has taken place here." ■

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**Erin Mullally** *is a freelance writer based in Dublin.*

**In a man-made fishpond near the mouth of the Bach Dang River, archaeologists have uncovered evidence of a 1288 battle in which Vietnamese forces routed a retreating Mongol fleet.**

# An Ancient Battlefield Emerges

## Evidence of a dramatic military victory has been found beneath fishponds and rice paddies around Vietnam's Bach Dang River

*by* LAUREN HILGERS

TODAY, THE AREA WHERE the Bach Dang River empties into Boc Ba and Halong Bays in northern Vietnam is a patchwork of rice paddies, villages, and man-made fishponds. But 700 years ago, before generations of farmers had altered the landscape, it was a coastal mudflat spanning dozens of square miles, a dynamic wetland where the river fanned out into meandering, sediment-rich streams. Islands emerged and disappeared with the tides, sandbars gave way to deep estuaries, and both high ground and navigable channels could be unreliable. The area was sparsely populated, but the Bach Dang was a gateway to Vietnam's center of power. It was a tributary of the Red River, which stretched from southern China to the Gulf of Tonkin. Following the Bach Dang 70 miles or so inland, a merchant ship—or an invading navy—would encounter the city of Thang Long, the seat of Vietnam's Tran Dynasty.

More than once, invaders had navigated the Bach Dang to Thang Long, so Vietnamese military leaders had, over the centuries, studied the tributaries and tides that altered the landscape with every ebb and flow. This knowledge was the basis for advanced military tactics and played a crucial part in an epic 1288 conflagration between forces of Vietnamese general Tran Hung Dao and an armada commissioned by powerful Chinese emperor Kublai Khan. The Battle of Bach Dang lit up the marshy landscape with flaming, sinking ships, and would earn Tran Hung Dao a place of honor in Vietnamese history.

Today, the remains of this battle, one of Vietnam's greatest victories, lie hidden beneath mud and paddy. For the past five years, an international team of archaeologists has been trying to piece together the Battle of Bach Dang—from the lay of the landscape to the tactical preparation that went into it—across miles of coastline. "One of the interesting things about where we're working is there were probably no people living there when the battle occurred," says Mark Staniforth, a senior research fellow at Monash University in Melbourne, Australia. "People started arriving there in A.D. 1500, they started to build on the islands, and they started to reclaim the land around them." Now the archaeologists, building on work from the 1950s, have been searching for evidence of the battle. The project is also working to build capacity for further archaeological research and data-sharing in Vietnam that they hope will open still more parts of the battle site to investigation.

**A satellite view shows that the Bach Dang River has been transformed by generations of farmers and development, concealing evidence of the 13th-century Battle of Bach Dang.**

The Tran Dynasty was established in Dai Viet (as Vietnam was then known) in 1226, when a wealthy family conspired against the mentally ill patriarch of the Ly Dynasty to place an eight-year-old, Tran Thai Tong, on the throne. During Tran Thai Tong's 30-year reign, the Mongol Empire to the north was expanding across Eurasia under the descendants of Genghis Khan. In their efforts to flank and conquer the Song Dynasty in southern China, the Mongols first invaded Vietnam overland in 1257, just after Tran Thai Tong's death. Despite initially taking the capital city of Thang Long, near what is now Hanoi, the invaders were turned away, though the Tran Dynasty did agree to pay tribute.

Battle-hardened warrior Kublai Khan had, by 1260, fought his way up through the ranks of Genghis Khan's grandchildren to become the fifth khan of the Mongol Empire and the founder of the Yuan Dynasty. In 1276 he defeated the Song and reunified China for the first time in 300 years. He undertook huge construction projects, rebuilt China's Grand Canal, expanded Beijing's lavish Summer Palace, and introduced the use of paper money. He also sent his son, Toghan, to try to claim Vietnam again, by then under the leadership of Tran Nhan Tong, the third Tran emperor. In 1284 the Mongols were able to retake Thang Long, but were once again turned away by Vietnamese generals employing guerilla and scorched-earth tactics. Burned again, Kublai Khan shifted his strategy and eyed a southern route by water. "In hindsight, wherever the Mongols went on dry land, they pretty much won," Staniforth says. "What they weren't good on—they weren't good on ships."

Jun Kimura, one of the members of the archaeological team working at Bach Dang, has spent much of his career studying Kublai Khan's maritime efforts, the earliest of which were against Japan. In 1274 and again in 1281, Mongolian fleets were bested by Japanese defenses and fierce storms. (In 1281, a two-day typhoon now known as the *kamikaze*, or "divine wind," wiped them out.) At a site off the coast of Japan, Kimura has helped excavate anchors, helmets, iron arrows, and a set of hollow ceramic objects that archaeologists believe might have been early grenades from one of the failed invasions.

For his third attempt to conquer Vietnam, Kublai Khan devised a strategy based on sending overwhelming numbers of soldiers—by land and by sea—to close in on its center of government from multiple directions, like a vise. His fleet, commanded by Mongol general Omar Khan, conquered the trading port of Van Don, near Halong Bay. Troops moving south overland met their naval counterparts in Van Don and moved west up the Bach Dang together, likely sticking to the widest, most welcoming part of the river. They descended on Thang Long with little resistance from either the Vietnamese forces or the landscape itself. This time, the Mongol army considered itself prepared for Vietnam's scorched-earth tactics. A fleet carrying food and supplies was expected to arrive soon after their forces took the city. The supply ships, however, would never reach the river.

In 2008, Kimura, then a Ph.D. student at Texas A&M University, and fellow graduate student Randy Sasaki received an email from Le Thi Lien, an archaeologist at Vietnam's Institute of Archaeology, who had learned of their interest in Kublai Khan's maritime campaigns. In the home of a local collector, she had come across a pair of huge wooden anchors that had been uncovered in the Red River. The collector thought they could have something to do with Kublai Khan's fleet.

"Jun came to me and said, 'This is an opportunity to go out and have a look and see if we can do any more work on the Vietnamese side,'" Staniforth, who was then at Flinders University in Adelaide, recalls. But Kimura also pointed out that "Ph.D. students don't have any money," so Staniforth and James Delgado, then president of the Institute of Nautical Archaeology at Texas A&M, set about helping to form an exploratory, collaborative expedition. Vietnam, owing to its recent history, had long been a difficult country for Western archaeologists to study. Although Vietnamese researchers had worked on a handful of sites over the years, their findings were published primarily in Vietnamese. Staniforth and Delgado had found a local collaborator in Lien.

On their first visit, in 2008, Kimura and Sasaki found that the anchors actually dated to sometime during the eighteenth or nineteenth centuries—but Lien directed the team to a new target. East of Hanoi, Vietnamese archaeologists in the 1950s had uncovered a set of river defenses in a field near where the Bach Dang meets the sea. They had found a cluster of thick wooden stakes, buried in the mud, pointing up at various angles. Historical records indicate that such defenses—fields of stakes driven into the riverbed and banks—were part of the Vietnamese naval defense plan at the Battle of Bach Dang in 1288, and were also used during two earlier battles in the same area, against invaders from the Han and Song Dynasties in 938 and 981, respectively. But it is unclear how the stakes were used in each battle, or the military tactics they allowed. The Vietnamese archaeologists in the 1950s had assumed the ones they found dated to the Mongol invasion, but there were many unanswered questions and there was no way then for them to be dated definitively. "They had pretty good evidence, historical evidence," Staniforth says, "but they didn't have scientific proof." Official reports recorded the discovery of more such examples at construction sites in the area, and locals had reported stumbling on wooden stakes in their fields. Before 2010, however, no archaeologists had responded to these other reports.

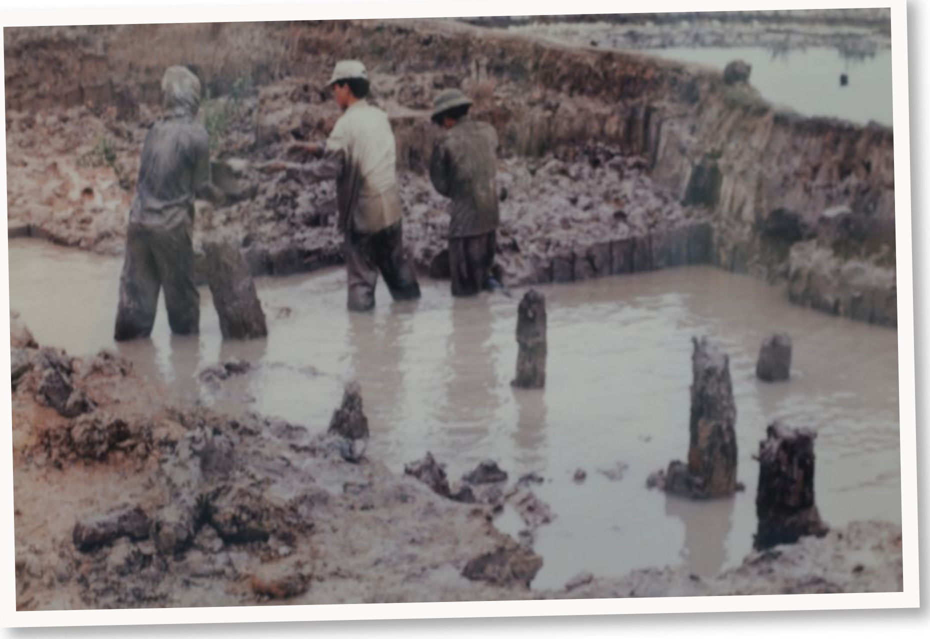
"The previous Vietnamese researchers couldn't really explain how the stakes were distributed," says Kimura, who is now at Tokai University in Tokyo. "In the 1950s people couldn't use radiocarbon dating or GPS," he adds. "We were lucky that in 2009 a local farmer reported that he had found some unique features in a fishpond. First we did test excavations there and revealed a concentration of wooden stakes—it wasn't just isolated ones." This discovery came as a surprise, in large part because it was not connected with where they had first been found. This was a new, distinct stake yard.

Similarities between the two sites were hard to ignore. The types of wood and the manner in which the stakes were driven into the ground were the same. "We carefully recorded their diameters and we found there was consistency between the two sites," Kimura says. He and Staniforth returned to Vietnam in 2010, 2011, and 2013 to excavate the Bach Dang fishpond, search for additional sites, and train Vietnamese archaeologists to begin searching for the remains of Mongol boats in the river itself. The archaeologists brought in a water pump and excavated four muddy trenches that they eventually expanded into one stake-filled expanse. They uncovered 55 stakes in all, along with pieces of ceramic and wood. Perhaps most importantly, samples from the stakes dated to approximately 700 years ago, meaning that they almost certainly were related to the Mongol invasion.

The stakes were similar to those found in the 1950s in layout and orientation. They had been driven into the earth at shallow angles. Some were planted in two columns running east–west, along what would have been the rising slope of a riverbank. Others were grouped in dense clusters, as if to form focused barriers. And still others were planted in pairs with their tips crossing. By studying the placement and orientation of the defenses, the international team began to see just how Tran Hung Dao conceived, planned, and executed a strategy that would make the Yuan Dynasty reluctant to ever return to Vietnam.

TOGHAN'S MONGOL SOLDIERS, who had marched to Thang Long with so little resistance, found an abandoned city burned by the Vietnamese. The Mongols found little of substance to conquer—and even less to eat. The invading army had little to do but wait for the enormous supply fleet to make its way slowly up the river.

As soon as this fleet entered the Bach Dang, Vietnamese forces sprang into action. They only had a matter of months to lay their elaborate trap. Tran Hung Dao had studied previous military engagements against the Chinese at Bach Dang, specifically the battle against the Han Dynasty in 938, and he and his officers knew the landscape intimately. The inconstancy of the river itself would serve as their primary weapon. He used the shape of the landscape as a framework for his defenses, incorporating rock formations and natural bottlenecks. He mobilized a large work force that began cutting down enough trees to make an enormous trap that would allow Vietnamese forces to go from defense to offense. This labor force needed



**Vietnamese archaeologists first studied stakes thought to be related to the Battle of Bach Dang in the 1950s, but didn't have the modern tools that have allowed researchers to understand how they were used.**

**One of the stakes excavated in the 1950s is displayed in a small historical museum near the site of the Battle of Bach Dang.**

to work fast—the trees had to be brought in from forests some distance away, fashioned into stakes, and then set in place. "This was a huge logistical exercise," Staniforth says. "It must have taken thousands, perhaps more, of the local Vietnamese people."

Previous theories of the Battle of Bach Dang, Kimura says, posited that the Vietnamese used stakes to simply block the entire river mouth—some 200 yards across—and then rowed out to attack the blockaded Mongol soldiers or attacked them as they tried to flee to the shore. The archaeological team brought modern tools to map the landscape and the way that it has changed since 1288, and they saw a different battle entirely. "We realized," Staniforth says, "that the rivers are too deep and too difficult," for the Vietnamese to have simply blocked them completely with stakes.

Staniforth and Kimura used satellite imagery and aerial photographs, along with extensive core samples, which, in their layering, held evidence of how the area had changed over time. They observed a different, more dynamic landscape, one that provided opportunities for Tran Hung Dao to structure his defense and deploy the stakes strategically. "It was a series of small islands that, at high tide, were covered in water. There were probably five channels then and now there are only three. Two of them have essentially disappeared under the rice paddies," Staniforth says. "The stake fields were simply there to channel the ships into a narrower gap, which was then plugged with something else, perhaps rafts."

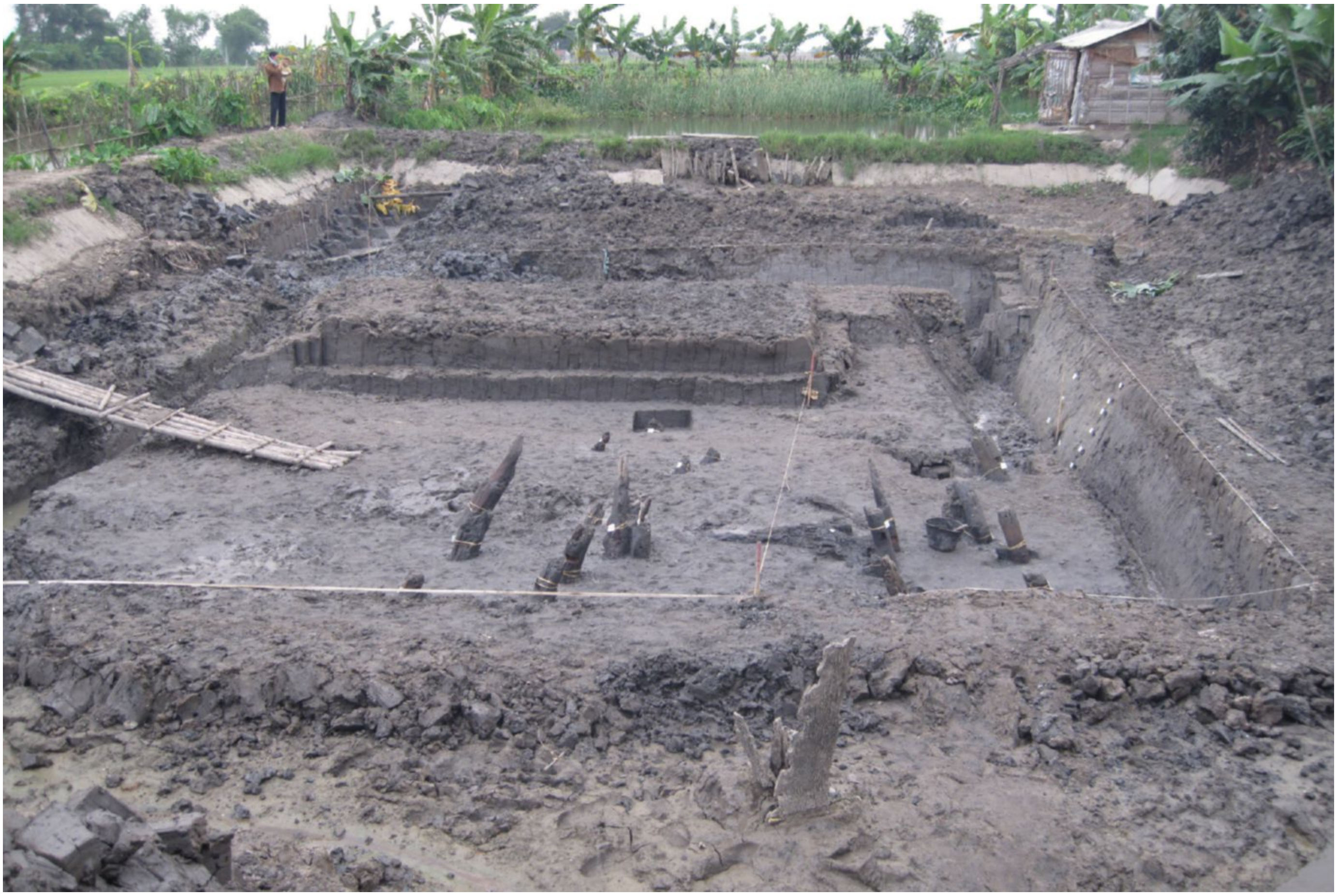
Historical records state that the Mongol supply fleet—around 400 ships—was defeated by Vietnamese forces somewhere near the ancient city of Van Don, though archaeologists have yet to find the site. Without the expected supplies, Toghan decided to withdraw his troops from the city. They boarded ships and moved down the river. Vietnamese forces were waiting for them, and baited the retreating fleet—either slowing them down or speeding them up—to make sure Toghan was in the right place at the right time, caught between stake yards as the tide went out.

The archaeologists found stakes made of three different species of wood: mahogany, wood from citrus trees, and ironwood. They were delicate and had been damaged by shipworms. The stakes fell into groups of three different sizes—approximately two, five, and eight inches in diameter. The smallest of them would have been of little use in stopping the Mongol ships.

"If you look at the fields where they put the stakes, you realized that, yes, part of their point was to stop the ships," Staniforth says. "But at least part of it was to stop the Mongol army from getting off the ships onto dry land." The Vietnamese had taken up positions on some of the small islands in the river, and then fortified them with the slimmer stakes to prevent escaping soldiers from swimming to dry land. "They are essentially antipersonnel systems," Staniforth says. "If you have a lacework of small stakes, a three- or four-inch-diameter stake is a pretty major obstacle for men."

Barred from escape by water by the larger stakes, sandbars, rafts, and Vietnamese ships, and pinned into their boats by the smaller stakes, the Mongol army was spectacularly doomed. From the safety of the islands and marshy high ground, Tran Hung Dao and the Vietnamese army sent smoldering rafts out toward the enemy vessels. The ships went up in flames, and

**Archaeologists from the Bach Dang project are helping train a new generation of underwater archaeologists to search the river for evidence of the defeated Mongol fleet.**



**Once it was drained, the Bach Dang fishpond revealed 55 stakes in three different sizes. Some were used to stop ships, while others prevented Mongol soldiers from escaping to dry land.**

the Mongol army was decimated. Omar Khan was captured and executed, while Toghan had narrowly escaped with his life, only to be banished by his furious father, Kublai Khan. The two sides exchanged prisoners, and while the Tran Dynasty acknowledged the supremacy of the Yuan Dynasty, China would not return to Vietnam until a more successful Ming invasion in the early fifteenth century.

THE DISCOVERY AND ANALYSIS of the stake fields near the mouth of the Bach Dang reveal some of the tactics used by the Vietnamese to defeat the Mongols, but there is potentially much, much more beneath the paddies and ponds. In the excavation, Kimura, Staniforth, and their colleagues have found flat wooden fragments that could be manufactured woodwork, as well as fragments of wood that show processing marks, such as rope holes for transportation. These could be the scattered remains of some of the burned Mongol ships, but so far, the researchers have found no hulls or further ship remains.

But they think the ships are likely down there. "When a ship burns, it doesn't burn completely," says Delgado, who is now director of maritime heritage at the National Marine Sanctuaries program of the National Oceanic and Atmospheric Administration. "The upper parts of the ship burn very hot, but the ship will break up and sink. The hull usually stays intact." He believes they are somewhere under the rice paddies, perhaps located under local burial grounds, which are largely off-limits to archaeological exploration.

The search for the ships continues, including underwater in the river itself. Kimura would like to expand the investigation, and hopes to find more evidence of the Mongol side of the battle, such as examples of the ceramic grenades and other artifacts from the invasions of Japan. As they did for this project, the researchers from the United States, Australia, and Japan will work closely with their Vietnamese counterparts and help build Vietnam's capacity for larger, more complex archaeological projects, even as they search for more answers themselves. Vietnam's Institute of Archaeology has created its own department of underwater archaeology, and Kimura, Staniforth, and other archaeologists run a field school every summer to help train Vietnamese archaeologists on sites south of Bach Dang, where the underwater visibility is better than it is in the area of the battle. "I'm a firm believer in not driving the research agenda from the outside," Staniforth says. "We are bringing this project to the world, as opposed to bringing the project to Vietnam." ■

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**Lauren Hilgers** *is a journalist based in Brooklyn.*

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Archaeologist Bárbara Arroyo and graduate student Jorge Méndez sift through the remains of the Maya city of Kaminaljuyú in her Guatemala City laboratory.

# Maya Metropolis

## Beneath Guatemala's modern capital lies the record of the rise and fall of an ancient city

*by* Roger Atwood

Walk into any archaeologist's laboratory and you're likely to see bags of broken pottery. Walk into Bárbara Arroyo's laboratory in a warehouse on the edge of the ruins of Kaminaljuyú in Guatemala City and you'll find bags containing millions of pottery sherds, stacked almost to the ceiling. Millions more sit in the vaults of the National Museum of Archaeology and Ethnology a few miles away. Outside Arroyo's laboratory, she and her team have dumped thousands upon thousands more ancient ceramic scraps into a large hole. "They can't take any more at the museum," she says with a shrug, gesturing out a window at the overflowing pit.

Long before archaeologists came to this area, visitors who had seen ancient Kaminaljuyú's pyramids and platforms wondered what it had once been. In 1893, the British explorers Alfred and Anne Maudslay saw the city's overgrown mounds—they mapped about 110 of them—and wrote that it must have been a "a fair-sized town" in the distant past but was now "a mere ghost town…without history or name." In 1936, American archaeologists Edwin Shook and Alfred Kidder were amazed by the site's "massive public buildings." They counted more than 200 ancient structures and found that Kaminaljuyú, which means "hills of the dead" in the Mayan language K'iche', stood at the center of an urban agglomeration that included some 35 more Maya settlements in the immediate vicinity.

Yet what most struck Shook and Kidder, and what continues to impress archaeologists today, was the sheer quantity of ceramics they saw. The people of Kaminaljuyú made pots on an industrial scale. Excavating one burial mound, Shook and Kidder counted 7,000 sherds per cubic foot

**A 6-foot-deep pit outside Arroyo's office contains some of the millions upon millions of potsherds that have been excavated in the city.**

of soil and estimated that the whole mound contained the "astounding total" of 15 million fragments—the remains of some 500,000 once-intact ceramic vessels. Millions of pots were intentionally and systematically smashed by the ancient city's own residents, or by invaders. The uncounted sherds throughout the site, excavated by Arroyo and earlier archaeologists, are physical evidence of both the city's huge population and its turbulent history of collapse and revival.

Built alongside an ancient lake, Kaminaljuyú was once the most populous Maya city in the southern highlands. The lake dried up centuries ago, and all that's visible of the ancient metropolis today are the grassy hills and overgrown pyramids of the Kaminaljuyú Archaeological Park, which Arroyo directs, along with a few other ancient mounds scattered around Guatemala City's western barrios. Some of those ruins are no more than half-eroded humps, hemmed in by cinder block houses and parking lots. Others, such as the multilayered complex known as the Acropolis, where Arroyo is currently excavating, hold the remains of centuries of Maya history. "Underneath the modern city is another city that lived and died in the time of the Maya," says Arroyo. "Not many people are aware of this, but it's all there."

Arroyo has seen some—but not all—of the last remains of Kaminaljuyú swallowed up by urban sprawl. Some areas have been paved over for housing projects, others for shopping malls, while still others, she says, have undoubtedly been lost without anybody even knowing about them. One ancient pyramid, today a nondescript mound, sits in the garden of a private mansion. The owners of the house won't let Arroyo look at the site, much less excavate it, so she hopes to inspect it with a drone. "It's important to gather information about what's left, even if you can't dig," she says. Nothing seems to faze her, not even the crime and blight in neighborhoods where some of Kaminaljuyú's mounds still stand. At one, a group of homeless children have taken refuge. At another, nearby walls are covered in gang graffiti.

A few miles west, across a deep gorge, lies what used to be Naranjo, a city nearly as big as Kaminaljuyú. The early photographer Eadweard Muybridge visited Naranjo in about 1875 and photographed its ancient stone monuments, after which the site remained more or less unmolested until 2008, when it was completely paved over to make a gated community. Its houses now have whitewashed walls and red roofs like a fantasy version of a rural Spanish village. Arroyo was able to excavate and even move some of Naranjo's monuments to a large traffic island in the middle of the new residential complex, but the rest of the site is lost forever. "Here we salvage what we can before it disappears," she says, walking among the rescued stelas. "That's a big part of what I do, salvage. And then it's gone."

About a mile south of Naranjo, Arroyo inspects a muddy vacant lot where a shopping center is soon to be built. She suspects the site might contain archaeological remains. With tractors and earthmovers grinding away nearby, she scans the ground for telltale scraps of ancient pottery. She doesn't find any. The land may already have been so disturbed that nothing of the ancient city remains on the surface, she says.

Ruins are safe from encroachment in the Kaminaljuyú Archaeological Park, however. Although it covers less than 10 percent of the ancient city's land area, the park is an island of tranquility among the modern capital's congested streets, where Guatemala's past and present mix uneasily. Under a grove of palms, shamans hold ceremonies with fire and aromatic spices, amid rings of chanting worshippers. Such rituals were violently suppressed under Guatemala's former military regimes. Today they can attract hundreds of people. "The military said we were worship-

**The remains of an elite Maya tomb excavated in the 1930s and 1940s lie under a grassy mound in the courtyard of a private archaeology museum in Guatemala City.**

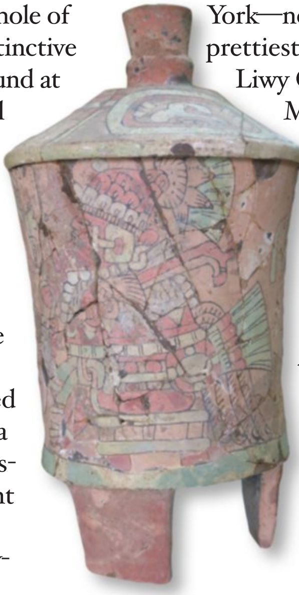
ping Satan, that we were satanic," says the master of one ceremony, Apolinario González, who is dressed in a multicolored Indian tunic. "We are Maya and we worship as Maya," he says. Nearby, a group of Christian evangelists walk on their knees in penitence across a lawn toward an open Bible. Under the same lawn, Arroyo once excavated the remains of two children killed in Maya sacrificial rites in about A.D. 100. Their tiny skeletons were found face down, surrounded by ceramic pots that would have contained food for the afterlife.

By digging at Kaminaljuyú's surviving sites, Arroyo and earlier archaeologists have pieced together a thousand-year-long history of expansion and contraction, the rise and fall—and rise again—of a major city. The earliest known archaeological remains of Kaminaljuyú date from around 800 B.C. Within a few centuries, it became a trading center for salt and shells heading from the Pacific coast to the Petén lowlands, and for feathers, chocolate, and jade coming the opposite way.

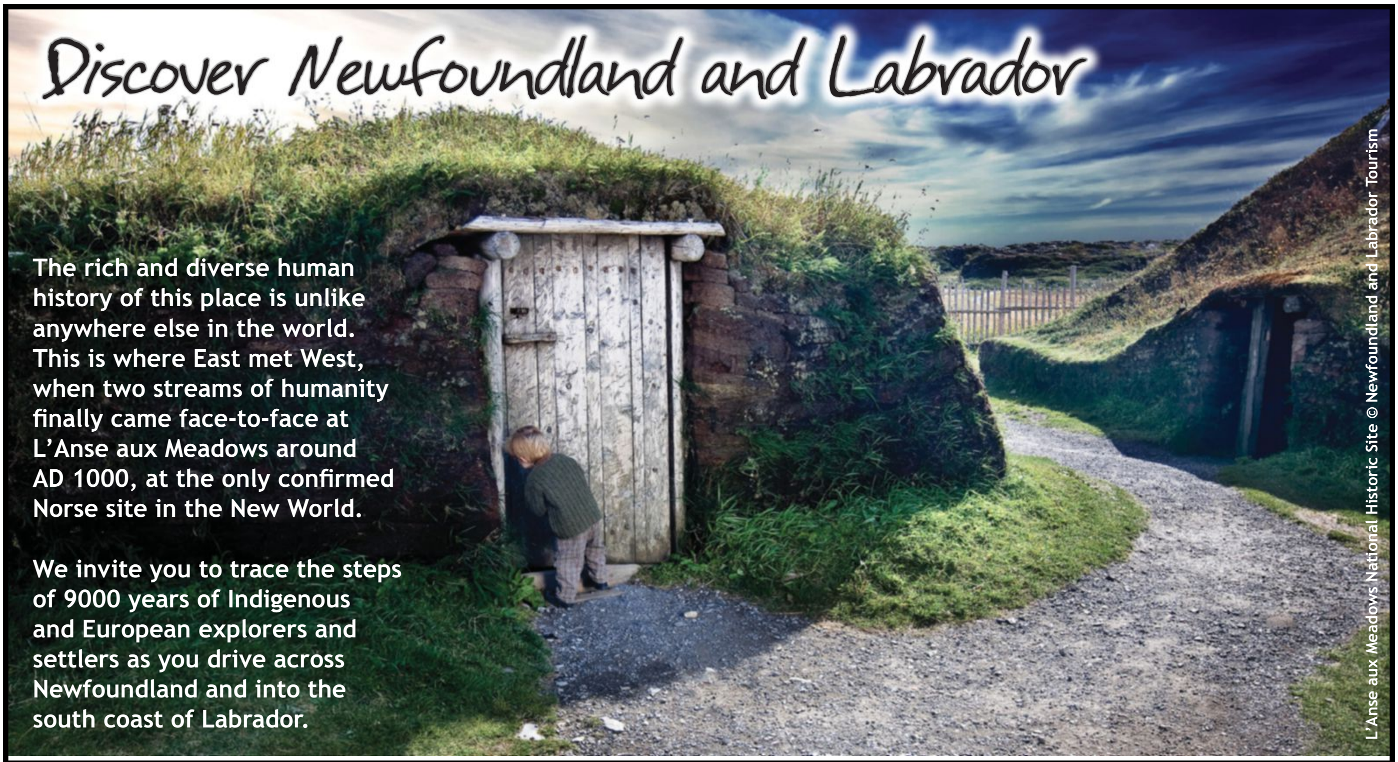
Obsidian, used to make knives and axes, also contributed to the city's early prosperity. The quarry at El Chayal, about 25 miles east, supplied raw material to the whole of the Maya realm, and its distinctive jet-black stone has been found at archaeological sites from El Salvador to the Yucatán. Arroyo has recovered thousands of chips from obsidian mined there all over Kaminaljuyú. "Most likely, the city controlled El Chayal," she says, as one of her assistants washes a few dozen freshly excavated flakes and places them on a paper towel, each one a glistening black. "That brought great wealth to the city."

Excavations have uncovered both high-status structures and humble dwellings, suggesting that different social classes lived side by side. The city, including its ceremonial centers, was built almost entirely with adobe and timbers, unlike other Maya cities with their lofty limestone temples. "Kaminaljuyú was like New York—not the oldest city or the prettiest, but the richest," says Liwy Grazioso, director of the Miraflores Museum, which is devoted to the history of Kaminaljuyú and built partly atop one of its mounds. "It was a great nexus of people, technology, and goods."

Kaminaljuyú continued to grow until about 400



**An incense burner decorated with paintings of deities was made in Kaminaljuyú, a city with tremendous ceramic-producing capabilities.**



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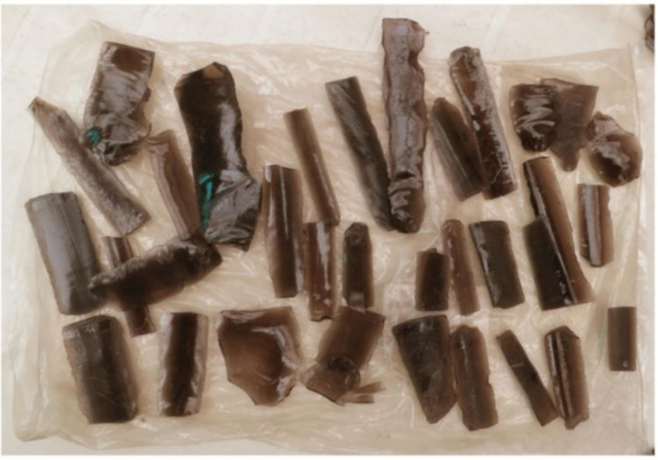


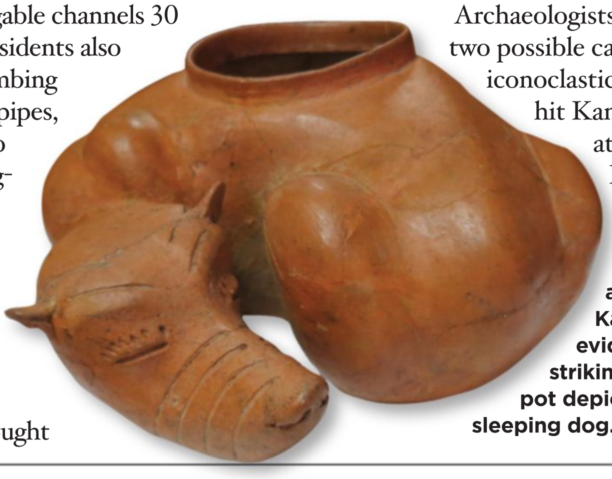
**Obsidian blades like these, made from raw materials taken from the El Chayal quarry near Kaminaljuyú, were traded and used all over the Maya world.**

B.C., when, for reasons archaeologists debate, cities up and down the southern Guatemalan highlands saw a sharp decline in building and population. This "Middle Preclassic collapse," as it is known, occurred around the same time as the fall of La Venta and other Maya cities in southern Mexico, with which Kaminaljuyú had lively trade ties. But unlike those places, Kaminaljuyú came back. Within a few centuries it was again seeing explosive growth in population, but also, more ominously, heavy erosion and deforestation as the city's growing population cut trees for fuel and dwellings.

Using its new prosperity, the city constructed a web of canals, pools, and pipes that created what Arroyo calls an "aquatic landscape," not unlike that of the Aztecs' lakeside capital of Tenochtitlán about 1,000 years later. The canals ranged from narrow culverts to navigable channels 30 feet wide. Residents also installed plumbing and laid clay pipes, which Arroyo has found segments of, to carry water under the streets of the ancient city. A three-mile earthen aqueduct brought fresh water into Kaminaljuyú from a spring. These waterworks were built to last. After the Spaniards arrived in the 1500s, they constructed their own aqueduct on top of the original Maya one. The whole structure snakes through Guatemala City to this day, a mound dating to more than 2,000 years ago, topped by a line of Roman-style arches.

This complex system of hydraulic engineering was ultimately Kaminaljuyú's undoing. The canals silted over and the water supply failed as the lake retreated due to drought, overuse, or both. Facing an acute water shortage, the city was again in upheaval by A.D. 150. Around that year, people deliberately chiseled away images that the city's rulers had carved into stone monuments over centuries to mark the passage of time and to record history. They broke them and threw the pieces away like trash. Stone carvings of animals associated with water—mostly frogs and turtles—were smashed. Millions of ceramic pots were also intentionally broken and discarded. The city's population plummeted, presumably due to mass migration.

Archaeologists speak of two possible causes for the iconoclastic spasm that hit Kaminaljuyú at this time. Federico



**The skill of the artisans of Kaminaljuyú is evident in this striking ceramic pot depicting a sleeping dog.**

Fahsen, a Maya epigrapher at the University of the Valley of Guatemala in Guatemala City, believes illiterate K'iche' invaders swept in from the north, overwhelming the city's cultured elite. "The early K'iche' look down at this rich city in the valley, and say, 'We want that for ourselves,'" Fahsen says, sitting in his office a short drive from the Kaminaljuyú ruins. "They enter the city, destroy the monuments, and erase the stone carvings in a frenzy of invasion and destruction."

Arroyo, however, leans toward internal upheaval as the cause of the unrest, perhaps triggered by anger over failing water supplies. There may have been other sources of resentment, too. For hundreds of years, the city's literate elite had been using Maya script and artistic styles similar to those seen at San Bartolo, El Mirador, and other major Maya sites in the hot lowlands of northern Guatemala. After about A.D. 150, in Kaminaljuyú, those scripts and styles disappeared. They were erased from stone monuments and never employed again. "It's possible," explains Arroyo, "that the destruction of monuments and broken ceramics that we're seeing were the result of a rebellion or rejection of some kind toward a governing elite that was linked by trade to the Maya lowlands. There was a return to local ways of doing things."

Judging from the quantity of new construction and ceramics being made two centuries after Kaminaljuyú's second collapse, the city regained its population and trade ties for a time. In this period, a new cultural power also arrived in the region from the central Mexican metropolis of Teotihuacán. Exactly how Teotihuacán's influence spread throughout the Maya realm to the south around A.D. 350—by invasion, mass migration, a shift in elite tastes, or,

*(continued on page 62)*

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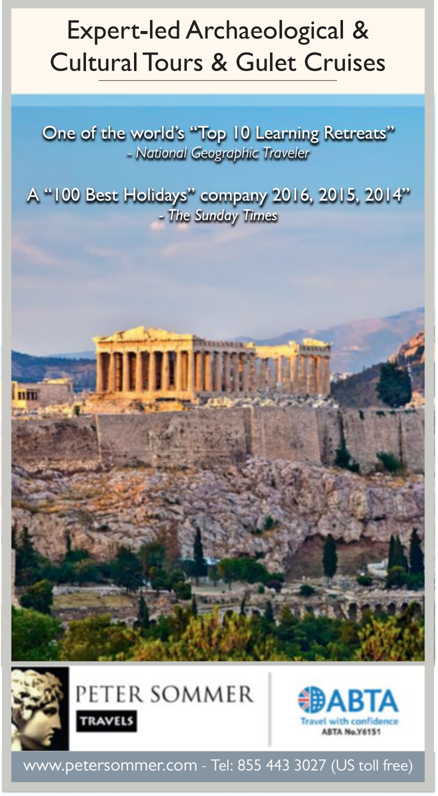

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**An indigenous woman lights a fire and burns aromatic wood and spices within Kaminaljuyú Archaeological Park echoing Maya traditions of worship.**

*(continued from page 59)*

perhaps some combination—is poorly understood, but there was likely some movement of people. "When people from Teotihuacán arrive, they find a society still traumatized by the invasions of two centuries earlier, so the people of Kaminaljuyú easily took to the new culture," says Sonia Medrano, a Maya specialist at Guatemala City's University of San Carlos. A new style of architecture appeared, the *talud-tablero* style, typical of Mexican pyramids, with sloping walls and protruding ledges. Stone depictions of the city's rulers also changed. No longer did they appear as supernatural beings, with jaguar fangs or bird wings, but as flesh-and-blood people. Similarly, the city's governors no longer appeared as gods and instead became more earthly, mundane figures. All these shifts suggest less a conquest than a co-option by the Mexican cultural order, explains Arroyo. "I think what existed between Teotihuacán and Kaminaljuyú was an alliance between governing elites, a confluence of interests that allowed Kaminaljuyú to regain its trade ties and prosper again," she says.

The new order did not last long, however. Around A.D. 700, Kaminaljuyú's population declined once again as the Maya city of Copán, in present-day Honduras, rose in power and prestige. Kaminaljuyú was abandoned and never reoccupied, perhaps once again due to faltering water supplies. In some ways, the city's fate foreshadowed the collapse of the wider Maya world around A.D. 900, which, say many archaeologists, may also have been triggered by widespread water shortages. Like the Maya world at large, Kaminaljuyú had its glory years before hitting hard times. Spanish conquerors made no mention of the site in their writings, and by the time Muybridge arrived, it was nothing but a vast cornfield. Only in the twentieth century did the area recover the population density it had had in antiquity, a new city once again built on top of the old. ■

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**Roger Atwood** ***is a contributing editor at*** **ARCHAEOLOGY.** ***For more images of Guatemala City and its ancient ruins, go to archaeology.org/guatemala***

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# Chicago Doctor Invents Affordable Hearing Aid

## Outperforms Many Higher Priced Hearing Aids

*Reported by J. Page*

**CHICAGO:** A local board-certified Ear, Nose, and Throat (ENT) physician, Dr. S. Cherukuri, has shaken up the hearing aid industry with the invention of a medical-grade, affordable hearing aid. **This revolutionary hearing aid is designed to help millions of people with hearing loss who cannot afford—or do not wish to pay—the much higher cost of traditional hearing aids.**

> **"Perhaps the best quality-to-price ratio in the hearing aid industry" – Dr. Babu, Board-Certified ENT Physician**

Dr. Cherukuri knew untreated hearing loss could lead to depression, social isolation, anxiety, and symptoms consistent with Alzheimer's disease. **He didn't know why hearing aids were so expensive when the prices on so many consumer electronics like TVs, DVD players, cell phones, and digital cameras had fallen.**

Since Medicare and most private insurance plans do not cover the costs of hearing aids, which can cost between $2,000-$6,000 for a pair, many of the doctor's patients could not afford the expense. Dr. Cherukuri's goal was to find a solution that would help with the most common types of hearing loss at an affordable price, similar to the **"one-size-fits-most" reading glasses** available at drug stores.

- **Designed by a Board-Certified Ear, Nose, and Throat (ENT) Doctor**
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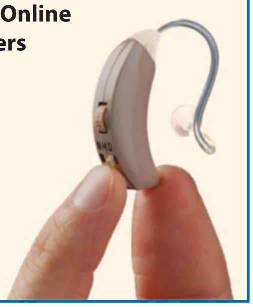

He evaluated numerous hearing devices and sound amplifiers, including those seen on television. Without fail, those were found to amplify bass/low frequencies (below 1000 Hz) and were not effective amplifying the frequencies related to the human voice.

### Inspiration from a Surprising Source

The doctor's inspiration to defeat the powers-that-be that kept inexpensive hearing aids out of the hands of the public actually came from a cell phone he had just purchased. **"I felt that if someone could develop an affordable device like an iPhone® for about $200 that could do all sorts of things, I could create a hearing aid at a similar price."**

### Affordable Hearing Aid with Superb Performance

The high cost of hearing aids is a result of layers of middlemen and expensive unnecessary features. Dr. Cherukuri concluded that it would be possible to develop a medical-grade hearing aid without sacrificing the quality of components. The result is the **MD**HearingAid ***PRO***, well under $200 each when buying a pair. **It has been declared to be the best low-cost hearing aid that amplifies the range of sounds associated with the human voice without overly amplifying background noise.**

### Tested by Leading Doctors and Audiologists

The **MD**HearingAid ***PRO*** has been rigorously tested by leading ENT physicians and audiologists who have unanimously agreed that the **sound quality and output in many cases exceeds more expensive hearing aids.**

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—Dr. May, ENT physician

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# AIA and ASOR Convene Summit on Cultural Heritage Issues in Syria and Other Conflict Zones

In December 2015, the Archaeological Institute of America (AIA) and the American Schools of Oriental Research (ASOR) co-organized a two-day conference, *Seeking Collaboration: A Summit for Projects Collecting Cultural Heritage Data in Syria and Conflict Zones*. The summit, held in Washington, D.C., was sponsored by the National Endowment for the Humanities (NEH), with additional assistance from the Rust Family Foundation, the National Geographic Society (NGS), and the Council of American Overseas Research Centers. Representatives from 19 international groups involved in protecting the cultural heritage of Syria and other conflict zones met to identify opportunities for collaboration that could maximize the impact of their efforts.

**Phillipp Ackermann, minister and deputy chief of mission at the Embassy of Germany, addresses the audience at the AIA-ASOR summit, *Seeking Collaboration.***

In addition to promoting archaeological inquiry and supporting archaeologists and their research, the AIA advocates for protecting archaeological sites and preserving the world's archaeological heritage. The protection of cultural heritage in Syria and other zones of conflict is an urgent matter. Every day, archaeological and historical sites in these areas are being damaged or destroyed by war, terrorism, and looting. Dozens of nonprofit and nongovernmental organizations have responded to this crisis. Just in the latter half of 2015, cultural heritage conferences held at the Smithsonian, the Metropolitan Museum of Art, and the Asia Society called for the many groups working on this problem to find ways to achieve a division of labor and greater collaboration. The goal of the AIA-ASOR summit was to bring some of these projects together to move closer to that aim.

**A panel of archaeologists provides reactions to and observations of the events in Syria. Left to right: Christopher Thornton, senior director, Cultural Heritage Initiative, NGS, Samir Abdulac, ICOMOS, Amr Al-Azm, Shawnee State University and The Day After Project, and Salam Al Kuntar, Penn Cultural Heritage Center.**

Day one of the summit was a closed session hosted by NEH and moderated by Thomas Barritt of Ketchum Communications. Participants engaged in both large group sessions and breakouts to describe their projects, brainstorm principles of collaboration, and identify specific ways they could work together. On the second day, which was hosted by NGS, participants met to finalize discussions from the first day, agree on the principles of collaboration, and discuss the next steps for the initiative. A panel of representatives from grant-making agencies described the types of support available for cultural heritage protection initiatives. Panelists included representatives from NEH, the National Science Foundation, NGS, and the World Monuments Fund. The panel also included a private philanthropist with a strong interest in protecting cultural heritage.

The final program on day two was a public event held in the Grosvenor Auditorium at NGS. Christopher Thornton, senior director, Cultural Heritage Initiative, NGS, acted as MC. After a welcome by Susan Ackerman, president of ASOR, and Gary Knell, CEO of NGS, Phillipp Ackermann, minister and deputy chief of mission at the Embassy of Germany, announced a new memorandum of understanding between ASOR and the cultural heritage projects led by the German

**William D. Adams, chairman, NEH, makes remarks at the conclusion of the AIA-ASOR joint summit.**

Archaeological Institute and the Museum for Islamic Art in Berlin. This was followed by remarks from Mark Taplin, deputy assistant secretary of state, and William D. Adams, chairman of NEH. A lightning session was then held, in which representatives of the 19 attending groups had three minutes each to explain their projects and point out possible areas of collaboration. The lightning round was followed by reflections and observations from three Syrian archaeologists attending the summit: Samir Abdulac, ICOMOS, Salam Al Kuntar, Penn Cultural Heritage Center, and Amr Al-Azm, Shawnee State University and The Day After Project. The conference ended with final remarks from Adams and Andrew Moore, president of the AIA.

**Peggy Plympton, Deputy Chairwoman of NEH, welcomes summit attendees.**

A key outcome of the summit was that representatives of the organizations attending the conference unanimously agreed to abide by a set of principles of collaboration. In addition to accepting the principles, participants discussed practical steps. These included establishing a website for the initiative that would include contact information for participants, a database of all projects working in the area (not just those conducted by summit attendees), rules and regulations for data sharing, a forum for exchanging ideas, and a calendar for meeting and promoting projects. Participants agreed to actively look for opportunities to collaborate in data sharing, viewing and vetting data from different projects, adopting the same data management platform and the same standards for data collection, sharing best practices and expertise, providing training in data standards, and helping the people of Syria and other conflict zones who work on the ground.

A significant boost to the efforts was provided by an anonymous donor who contributed $25,000 for mini-grants to enable collaborating groups to meet and plan. Since the summit, the NGS has granted an additional $15,000 for this purpose. The summit organizers will outline the application and review process for these mini-grants and will also seek additional funding.

Finally, the participating groups agreed that it was important to let others in the world know about their work through conference presentations and workshops, publishing articles, promotion on websites and social media, and progress reports and updates in the Dispatches section of ARCHAEOLOGY magazine.

## Participating Organizations

Archaeological Institute of America
American Association for the Advancement of Science
The Antiquities Coalition
ASOR Cultural Heritage Initiative
Computational Research on the Ancient Near East, University of Toronto
CyArk
Endangered Archaeology in the Middle East and North Africa,
  Oxford University
The Getty Conservation Institute
International Council on Monuments and Sites (ICOMOS)
Manar al-Athar
The Oriental Institute of the University of Chicago
Penn Cultural Heritage Center
Shirin
The Smithsonian Institution
The Syrian Heritage Archive Project (a joint project of the German
  Archaeological Institute and the Museum for Islamic Art in Berlin)
The Day After Project
The Past for Sale Initiative at the University of Chicago
UNESCO
UNOSAT
United Nations Security Council
U.S. Committee of the Blue Shield
World Monuments Fund (WMF)
Yale University

## AIA Fellowships and Grants: Spring 2016 Deadlines

SAMUEL H. KRESS Grants for Research and Publication in Classical Art and Architecture funds publication preparation or research leading to publication undertaken by professional members of the AIA. Deadline: March 1

The AIA Publication Subvention Program offers subventions from the AIA's von Bothmer Publication Fund in support of new book-length publications in the field of Greek, Roman, and Etruscan archaeology and art history. Deadline: March 1

Jane C. Waldbaum Archaeological Field School Scholarship assists students with the expenses associated with participation in archaeological field schools. Deadline: March 1

Elizabeth Bartman Museum Internship Fund assists graduate students or those who have recently completed a master's degree with the expenses associated with participating in a museum internship either in the United States or abroad. Deadline: April 1

Society Outreach Grant Program encourages AIA Local Societies to undertake activities that promote archaeology in local communities. Deadline: April 15

All AIA programs and initiatives including cultural heritage protection activities, site preservation, grants for excavation and publication, and outreach and education are made possible through the generous support of our members and friends. We thank you for your continued support. Please visit archaeological.org/giving or call 617-353-8709 to make a gift to the AIA.

# More than 2,400 at Annual Meeting in San Francisco

Annual Meeting attendees in the exhibit hall that features publishers, technology and archaeological supplies vendors, travel companies, educational institutions, field schools, and grant-making agencies.

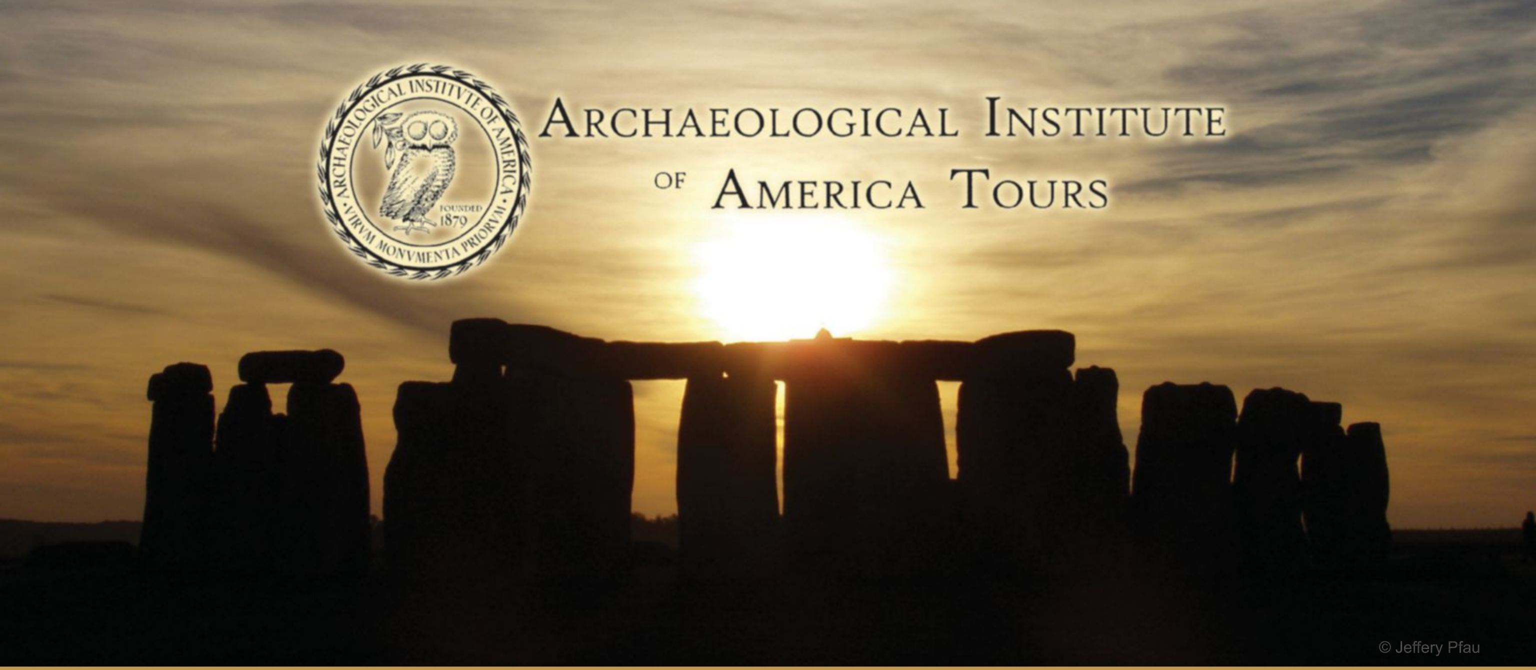
Gold Medal winner Malcolm Bell III gives his acceptance speech at the annual AIA Awards Ceremony.

The 117th AIA-SCS Joint Annual Meeting in San Francisco attracted more than 2,400 attendees making it the largest west coast gathering for the annual event. As in previous years, the Program for the Annual Meeting Committee put together an exciting and diverse program of paper and poster sessions, colloquia, roundtables, and workshops. The academic events were supplemented by awards ceremonies, committee and interest group meetings, receptions, and networking opportunities. The meeting started on a high note with Professor Lord Colin Renfrew's lecture titled *Looting and Beyond: Rediscovering the Early Cycladic Sanctuary on Keros* delivered to a standing-room only crowd. Renfrew, as he has done throughout his career, brought attention to the troubling issue of looting and its effects on archaeological sites and human history.

In addition to Renfrew's lecture, destruction of cultural heritage, especially in areas of conflict, and the response to it, was discussed in sessions titled *New Developments in Cultural Property Protection in Conflict Zones* and *Evidence and Emergency Responses to Cultural Heritage Destruction in the Middle East*. Other highlights from the meeting included the Presidential Plenary Session, *Climate Change and Human Society: Past, Present, and Future* which focused on human interactions with the environment, the AIA Awards Ceremony, and the annual Society Representatives' Breakfast. A number of sessions at the meeting honored scholars and long-time members of the AIA, including Malcolm Bell III, who received the Gold Medal Award for Distinguished Archaeological Achievement and Norma Kershaw, a lifelong supporter of the Institute. The AIA also conducted important administrative and governance business at the Annual Meeting including meetings of the Governing Board and the AIA Council.

The second AIA Educators' Conference was held on Saturday, January 9. Titled, *Next Steps: A Working Conference for Archaeological and Heritage Outreach Professionals*, the conference built on the success of last year's event held at the meeting in New Orleans and focused on the actions and activities that had occurred in the time between conferences, created a plan for the next year, and, most significantly, produced a draft statement of ethics for archaeological and heritage education that was endorsed by everyone in attendance. The statement will be distributed for comment and revision before it is finalized and shared with organizations and individuals working in the field. More news from the educators' conference will be published in a forthcoming installment of Dispatches.

The AIA-SCS Annual Meeting is a wonderful opportunity for archaeologists, classicists, heritage educators, AIA Local Society members, and anyone interested in the discipline to gather and learn from each other. Held over the first weekend in January, the meeting is a great way to be archaeologically inspired and renewed at the start of each year. We hope you can join us next year in Toronto for the 118th AIA-SCS Joint Annual Meeting.



# ARCHAEOLOGICAL INSTITUTE OF AMERICA TOURS

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> *"Our AIA leaders were the best I've ever seen. The small size of the group was also great. This was our second trip with the AIA, and I think you are the best"* - Tom and Cheryl, Florida

## FEATURED LAND TOURS

**PREHISTORIC TOMBS & STANDING STONES OF WESSEX & BRITTANY**
May 2016 (12 days) with Paul Bahn
and a maximum of 20 participants

**GEORGIA & ARMENIA: BEYOND THE GOLDEN FLEECE**
May 2016 (17 days) with Gocha Tsetskhladze
and a maximum of 20 participants

**IRELAND: LEGACIES & LANDSCAPES**
June 2016 (14 days) with Stephen Mandal
and a maximum of 15 participants

**UNDISCOVERED GREECE: MACEDONIA TO EPIRUS**
June 2016 (14 days) with Nancy Wilkie
and a maximum of 12 participants

**HIKING IN IRELAND & SCOTLAND**
August 2016 (15 days) with Stephen Mandal
and a maximum of 15 participants

**PREHISTORIC CAVE ART OF SPAIN & FRANCE**
September 2016 (13 days) with Paul Bahn
and a maximum of 20 participants

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aboard an 18-cabin motor/sail yacht

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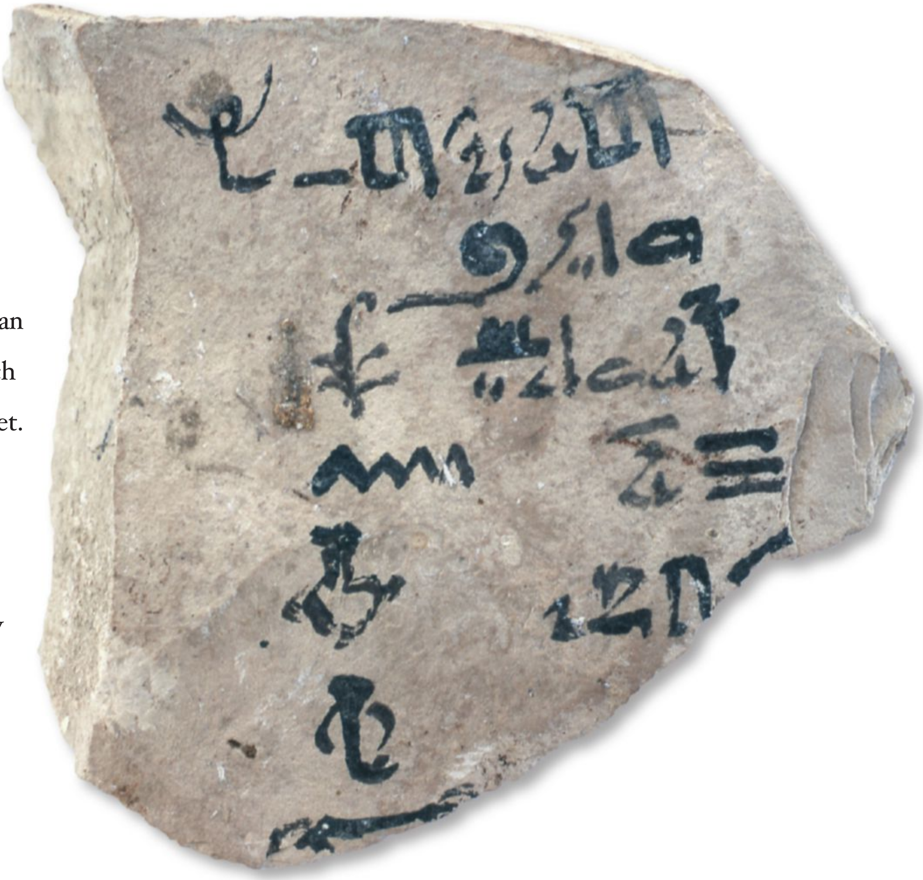
# ARTIFACT

The first alphabetic writing system was created in the Levant and Sinai Peninsula sometime in the second millennium B.C., probably between 1850 and 1700 B.C., by adapting Egyptian hieroglyphs—a writing system expressing both concept and sound—to represent only sound. This Proto-Sinaitic alphabet is the ancestor of many of the writing systems that developed across the world. Until now, the earliest known alphabet tables, called abecedaries, have been found on cuneiform tablets from Ugarit, in what is now Syria, dating to the thirteenth century B.C. But while studying an undeciphered ostracon found in a tomb at Luxor, Egyptologist Ben Haring of the University of Leiden discovered an abecedary that predates those tablets by two centuries, making it the oldest example ever found.

The order of the symbols is not the "ABC" of Western alphabets, but, explains Haring, the Ḥ-L-H-M that is the beginning of the well-known order of alphabets of the ancient Near East. This was the clue Haring needed to recognize that this might be an abecedary used by scribes or for teaching purposes. These words have initial sounds that begin at the extreme right of the first four lines. The individual characters are used to form single consonants or sets of two consonants. "As preserved, there are 13 lines on the front and back of the ostracon," says Haring. "If it were complete, there would have been anything between 25 lines, the number of consonants in the Egyptian hieroglyphic script, or 30 lines, which would represent the Ugaritic alphabet. But since it isn't complete," he says, "we don't know if the alphabet expressed here is native Egyptian or foreign. If it's Egyptian, it may imply an important role for Egypt in the development of the alphabet."



**WHAT IS IT**
*Ostracon*

**CULTURE**
*Egyptian*

**DATE**
*15th century B.C.*

**MATERIAL**
*Limestone*

**FOUND**
*Luxor, Egypt*

**DIMENSIONS**
*3.54 inches high,*
*3.34 inches wide,*
*0.9 inches thick*

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